GAS JOURNAL

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GOVERNMENT FUEL RESEARCH

THE Ministry of Fuel and Power has adopted the wholly commendable plan of informing the public, through the Press, of the work which it is doing and also of its intentions for the future in many directions. Will the Gas Council and the area boards please copy. The Minister was present last week at a largely attended Press gathering representing all sections of the Press when the subject for explanation and discussion was the work of the Chief Scientist's Division. Under the Ministry of Fuel and Power Act of 1945 the Minister, as Mr. Gaitskell explained, is responsible for securing the effective and co-ordinated development of coal and other sources of fuel and power and for promoting economy and efficiency in the supply, distribution, use, and consumption of fuel and power. Under the Nationalisation Acts the National Coal Board, the British Electricity Authority, and the Gas Boards are responsible, in general, for the production and supply of their respective products. The nationalised fuel industries are responsible for research in their own fields, after settling their programme in consultation with the Minister, a procedure aimed at the co-ordination of their researches and their dovetailing with investigations undertaken by Government establishments (such as the Fuel Research Station) and by industrial research associations (such as the Gas Research Board and the British Coke Research Association).

Provision having thus been made under the Nationalisation Acts for research generally into the production and supply of coal, electricity, gas and its by-products, Mr. Gaitskell explained that it became necessary to provide for research into the more efficient use and consumption of fuel and power, and in other fields that are not clearly the concern of one of the nationalised industries. The Minister, therefore, set up in June, 1948, the Scientific Advisory Council with Sir Alfred Egerton as Chairman to advise him on the scientific aspect of his statutory responsibilities. This Council, which includes among its members the representatives of the nationalised fuel industries as well as independent scientists, helps in advising on the co-ordination of research already referred to. The Minister also appointed as his Chief Scientist, Dr. H. Roxbee Cox, who took up his duties in September of that year. It is the aim of the Chief Scientist's Division, not only to encourage, support, and co-ordinate research and development throughout the whole of the fuel and power field, but to direct research in those parts of the field not otherwise provided for. The Chief Scientist's Division includes the Fuel Efficiency Branch of the Ministry, which dates from 1940 and which has, in conjunction with the Fuel Efficiency Committee, done much to increase the efficiency with which fuel and power are used in industry, in non-industrial premises, and in the home. Such is the broad picture.

At the meeting last week, Dr. Roxbee Cox amplified the Minister's remarks by giving examples of the work being carried out by his Division. Without going in to any detail we would mention two of the projects of especial interest to our own industry. In the *Journal* of December 7 we gave an account of the experiments on the underground gasification of coal following the announcement by Mr. Gaitskell that the project was in hand. The work is taking place at an open-cast site near Chesterfield on a seam which is quite unsuitable for mining in the normal way; and, as we recorded, the investigation is being directed by Mr. C. A. Masterman. The venture may prove negative; it may prove physically or economically unsound. If, however, the difficulties can be overcome (and a major difficulty lies in the boring) and means discovered to operate the process under the wide variety of conditions found underground, it would become possible to make use of some at least of the vast masses of coal which by reason of thinness of seam, dirt, or other cause, cannot be economically mined. Drilling was started last December, and it was hoped to achieve conditions favourable to ignition and subsequent gasification by the end of January. That hope has not been fulfilled, but we shall know before long how the attempt at ignition goes. In any case it is obviously desirable that data and experience should be gained on the proposition; research work which does not yield positive or commercial results is not for this reason wasted, for it can serve not only to fill or disclose gaps in our knowledge, but also to point the way to work in other channels.

In our issue of September 21, 1949, we gave the first 'gas' account of the plans for the Festival of Britain, saying that 'a remarkable feather in the cap of the gas industry which cannot but add to its prestige is the decision taken by the L.C.C. architects and engineers con-

cerned with the design of the concert hall for the South Bank to use gas not only in the kitchens, but for heating throughout the building.' At the time we did not know of a proposal on the part of the Ministry of Fuel and Power's Scientific Division, in collaboration with the L.C.C., to use a heat pump to provide part of the heating for the new concert hall. The heat pump, said Dr. Roxbee Cox last week, is 'a device which promises important advantages where there is a good source of low-grade heat readily available and where amenity considerations, such as require the elimination of solid fuel, are important.' Town gas is not a low-grade fuel, but the amenities of the Festival of Britain ruled out solid fuel—*i.e.*, coke, not coal—and town gas is to be used in the 1951 heat pump. Who can foretell the results of this highly interesting experiment? The heat pump is by no means a new idea, but it has so far found few applications in this country, though it has been used for large-scale heating purposes, the outstanding example in Europe being at Zurich. The possibility of applying the system to the ordinary small house was mentioned by Dr. Harold Hartley in an address in Manchester in March, 1948, and developments are known to be taking place in the United States of America. The Ministry of Fuel and Power is developing a heat pump incorporating new features for the heating—and the cooling—of a large building. Calculations made in the Chief Scientist's Division showed that there would be economic advantages in driving the heat pump by gas engines. Surplus Merlin aircraft engines, converted to running on town gas, are being tested for this purpose, the superchargers being modified to provide the compression required in the heat pump circuit. By this means it is hoped to demonstrate not only that this country can design and construct a heat pump of large capacity but that the methods of light engineering, such as are used in the aircraft industry, can be applied with economy and technical advantage to this class of engineering problem.

INDUSTRIAL SURVEY

ON the more general aspect—and this is away from research—we would mention the investigation being undertaken by the Ministry which is called the Industrial Survey. This aims at establishing an 'efficiency index figure' in terms of coal per unit product in each separate industry. At the moment 12 major industries are being examined and a detailed examination is being made of the use of heat, power, and steam, process by process, at a number of plants in each of the selected industries, the idea being to enable manufacturers to determine whether their costs of production could be reduced by more efficient fuel utilisation. We take it that this is irrespective of the particular fuel employed. It is up to the coal or the gas or the electricity or the oil interests to demonstrate which fuel should, in the general interest, be used. Then there is the mobile testing unit, described by Dr. Roxbee Cox as 'a new weapon to fight for increased efficiency in the utilisation of fuel and power.' This mobile unit was the subject of an illustrated article written by a member of our staff and published in the *Journal* of December 8, 1948. The unit has been designed to permit a balance sheet to be drawn up for any works—a heat balance sheet, of course—which will show on one side the energy used, whether in the form of coal, coke, gas, electricity, or oil, or any combination of them, and on the other side the amount of energy used in each part of and by each process in the works or factory. The unit is manned by Ministry staff, civil servants. Manufacturers have derived benefit from this public-purse service. Oliver Twist requests have led to an undertaking to provide an additional three units. In view of the financial benefits which are likely to accrue to users of the service the users are, quite rightly, being asked to contribute to the cost.

We have written at some length on what is happening in research and ordinary day-to-day testing-cum-advisory service sponsored by the Ministry of Fuel and Power. This vitality is encouraging and we hope and, indeed, believe that it will be maintained, for the seriousness of the issue and the possibilities of the work should and must transcend party politics.

CRITICISM AND CO-OPERATION

ARE the gas consultative councils thinking too much about criticism and too little about helpful co-operation with the industry of which they are an entirely new feature? At almost every meeting we have reported so far machinery for dealing with consumers' grievances if and when they fail to be settled over the showroom counter has been prominent on the agenda. Even so enlightened an authority as the North Thames Gas Consultative Council last Thursday spent some time on the question of the printing and display of posters to tell the public how and where to contact members of the district committees, presumably to lodge complaints, and seemed a little surprised that the area board, anxious that grievances should be handled through recognised channels, proposed to confine gas showroom information posters to the names of the chairman and secretary only. The North Thames council, probably the first in the country to complete its district committee organisation, has, however, recognised that interpretation to consumers of those difficulties which prevent the area board from doing all they would wish is just as important as, and certainly more helpful than, mere criticism, and with the help of a good Press—scores of newspaper cuttings were passed round at the meeting—has afforded enlightenment on the scarcity of refrigerators, the temporary absence of hire-purchase gas fires, and the economic limits imposed on the extension of gas supplies in rural areas.

In passing, it is worthy of note that the Gas Act says nothing about complaints in its definition of the duties of the consultative councils; another point liable to be overlooked is that members of the consultative council and its district committees, although nominated by particular local authorities or organisations, represent not only or even mainly the body nominating them but the consumers as a whole. The North Thames council, whose next meeting, originally fixed for the date on which the general election is to take place, has been deferred until March 2, has passed on to the area board a request that gas showrooms should be open on the busiest shopping afternoon of the week, even if it means a reversal of the Saturday half-day holiday, with the comment from one of the mem-

bers that 'we must throw our weight every time on the side of the needs of the consumers.' The area board has cordially welcomed an expression of opinion from the consultative council that the maintenance service for privately-owned gas water heaters offered by the board should be more widely publicised, and has promised that a standard maintenance service will be extended to all districts as soon as practicable.

HOTELYMPIA, 1950

'ONE cannot think well, love well, sleep well, if one has not dined well,' wrote Virginia Woolf, and there is much truth in it. Carrying the thought a stage further, we suggest that one cannot dine well unless someone has cooked well, and one cannot cook well without complete control of one's cooking medium. And this, surely, is the reason why gas brings successful cooking within the reach of thousands, and superlative cooking to those who combine this fuel with their innate skill in the craft. It is also the reason why the vast majority of catering appliances at Hotelympia are gas-operated. For this is not an exhibition where housewives can be wooed by colourful enamel; most visitors are members of the catering profession whose eyes are ever searching for possible snags—difficult cleaning, involved operation, slow heating up, excessive running costs, delivery delays, and so on. Few of these people whose livelihood depends upon a wise choice are impressed with 'smart' sales talk, superficial elegance, or unnaturally low prices. Our impression of the exhibition was that the determination of the exhibitors to sell was equalled only by the shrewdness of the customers.

This indicates a change of atmosphere since the last exhibition two years ago. This came after the gulf of the war period during which business of this nature was scant indeed. As a result, restaurateurs and hoteliers were agog for new apparatus and a minimum of sales technique was required. What competition there was existed largely on the time lag for delivery. Many customers selected the make of appliance for which the earliest delivery was promised. Today most appliances can be delivered from stock in days or weeks, and competition is fierce.

An examination of the exhibition and conversations with the manufacturers present can only result in a feeling of pride in the gas industry, not only because of the sheer weight of equipment displayed, but because of its quality, a quality which in almost every case was the reflection of long experience and constant progress. Perhaps more than any other industry this is intimately allied to its appliance manufacturers, and regard for its reputation is shared by all. It is not difficult to appreciate this fact at Hotelympia, where a number of new appliances bear witness to the industry's technical advance. In general, however, the trend is towards the refinement of existing models, the provision of more graceful lines, easier ignition, thermostatic control, improved burners, and the elimination of awkward corners and projecting controls.

Perhaps the most striking fact of the exhibition is the absence of the perennial warriors, the Gas Council and the Electrical Development Association, due, we believe, to the refusal on the part of the exhibition promoters to provide ground floor space. This is regrettable, and the presence in the gallery of many notable exhibitors leads us to believe that participation by these bodies, if only for prestige purposes, would have been well worth while. It therefore falls to the rest of the gas industry to compensate for the non-appearance of its standard bearer, and in this respect it is gratifying to note that the provision of equipment for the demonstration theatre—in many ways the 'plum' of the show—was most ably performed by the North Thames Gas Board.

Few will deny the success of this exhibition or the curious attraction of this highly specialised subject both for those connected with the catering industry, and for the layman who has so often speculated on what wonders lie behind the swinging doors marked 'Service Only.' He will, we think, be gratified by the attention paid to cleanliness and hygiene—an aspect of catering much in view these days—and by the obvious aim of the gas industry to provide not only swift and efficient cooking, but cooking under the finest possible conditions.

STUDENT TECHNOLOGISTS

WE recently commented on a series of letters in the correspondence column of *The Times* relating to the place of technological training in the universities. The correspondence was attracted initially by a *Times* leader which suggested that student technologists should be transferred from the universities, where 'they were applying themselves to a specialised professional training out of tune with the university spirit,' to good technological institutes. Such a diversion would, it was asserted, relieve the over-crowded universities and would, at the same time, be in the interest of the students themselves. In the *Journal* of December 21 we both noted the volume of criticism which this opinion evoked from the universities and added our own measure of criticism of this proposed 'splendid isolation' of the technologist.

Confirmation that *The Times* was barking up the wrong academic tree has now been provided by the Technology Sub-Committee of the University Grants Committee in 'A Note on Technology in the Universities,' published recently by the Stationery office. The report prefaces its conclusions by noting that the number of students in university departments of applied science has risen from 5,288 in 1938-39 to 10,916 today. The report states: 'The universities have thus done a great deal for the development of technological education in this country and have shown since the war a readiness to expand their provision at a rate comparable with the expansion of the science faculties.' It emphasises, in particular, that the Sub-Committee has heard no suggestions from the universities that they would wish to remove the teaching of technology from their activities. Moreover, 'we ourselves are in accord with the view that certain aspects of technology or applied science are well suited to university study.' Here the report makes a distinction between the functions of the university and those of the technical college, corresponding with a distinction between the two types of recruit required

by industry. The university graduate, who has taken courses more widely based on higher standards of fundamental science, might be less useful than the technical college man in the day to day affairs of industry, but he should be able to contribute more effectively as changing conditions in industry present new problems for solution. The report states that 'it is of the utmost importance that this characteristic difference should be fully appreciated by those responsible for the selection of students for university courses in technology and for the award of scholarships from the technical colleges to the universities.' Its recognition, the report adds, should dispel any idea that transfer from the first type of institution to the second is in any sense a form of promotion.

In discussing the policy of compromise adopted by British universities in rejecting both the continental practice of excluding technology from the universities and the American college system which includes a great range of work in technology and in technical studies, the report expresses satisfaction with the existing practice. 'We are satisfied,' the report states, 'that it is good for the whole university that technologists should form part of the student body, and that it is essential for the well-being of industry that some of their technologists should have been educated in universities in contact with students drawn from a wide variety of faculties.' The report adds that in some fields of technology university studies ought to be based on more extended courses in fundamental science than has been general hitherto. Consideration must also be given to the possibility of one or more post-graduate years in order to provide a more extended training for a limited number, and an approximate figure of 250 students a year is suggested. A final word of approval is given by the Sub-Committee to the arrangements for providing industrial experience during vacations for students in applied science.

Letter to the Editor

SPARE PARTS

DEAR SIR,—The point raised by Mr. Guthrie in your issue of January 18, regarding cooker spare parts, has been under consideration by appliance manufacturers for some time.

The useful life of a cooker, particularly if of cast iron construction, and well cared for, can well be 15 years or more.

Most of the manufacturers are not yet in a position to meet all the demands for gas cookers, and therefore do not feel it advisable to stop manufacturing spares for the majority of obsolete appliances; if they did stop consumers might be in the position of possessing unworkable appliances and yet unable to buy new models. That a time limit on manufacture of these spares is ultimately the right course to adopt is generally agreed, as this would relieve gas undertakings and manufacturers from carrying inordinate stocks of spares and of patterns.

It is probably because of this present great demand for new appliances that the manufacturer in question has found difficulty in interfering with his running lines in order to produce the special components required.

P. D. M. AIRD,
Chairman,
Sectio· VI, S.B.G.I.

Society of British Gas Industries,
56, Victoria Street, London, S.W.1.
January 27, 1950.

Personal

Mr. **William Wedgwood**, who joined the staff of the Jersey Gas Light Company in July, 1939, as Assistant Engineer and Manager, has been appointed Engineer and Assistant Manager, as from January 1.

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Mr. **E. W. Eves,** who has been with the North Thames Gas Board, Watson House, for the past 16 years, engaged in laboratory and development work, particularly on industrial controls, has joined Perl Controls, Ltd., as Technical Manager.

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Mr. **Richard Miles,** Managing Director of Head, Wrightson and Co., Ltd., has been elected Chairman of the Company in succession to the late Sir Guy Wrightson, Bt., and Sir **John Wrightson,** Bt., has been appointed Vice-Chairman.

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Mr. **William More,** who has retired after 45 years' service with the Hamilton (Fife) undertaking, has been presented with a wireless set and a wallet from the staff and workers. Mr. More was the first meter reader and collector to be officially appointed in the burgh of Hamilton. At that time the total number of slot meters was 400. Today it is 3,000.

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Mr. **James Francis Ronca,** O.B.E., A.R.C.SC., A.R.I.C., A.M.I.MECH.E., HON.M.INST.GAS E., F.INST.F., will succeed Dr. D. T. A. Townend as President of the Institute of Fuel in October, 1950. Mr. Ronca has served since May, 1945, as the Hon. Secretary of the Institute, having previously been a member of Council since 1933.

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Mr. **W. E. Dexter,** a founder member and committee member of the Gas Salesmen's Circle (North Western District) for the past 25 years, has resigned as a committee member and also as a member of the Circle. Mr. Dexter is now water heating representative of Radiation Group Sales, Ltd., for the whole of the North West area.

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Mr. **D. N. Maddocks** has been appointed Coke Manager to the West Midlands Gas Board. Other appointments announced by the Board are those of Mr. **J. N. Tatham** as Legal Assistant to the Board; Mr. **H. T. R. Lock** as Senior Audit Assistant, Worcestershire and Herefordshire Division; Mr. **C. G. Bailey** as Senior Audit Assistant, Shropshire Division; Mr. **W. Marsh** as Accountancy Assistant, Smethwick, Oldbury and West Bromwich; and Mr. **S. Emery** as Structural Engineering Assistant, Coventry.

Obituary

Dr. T. Lewis Bailey.—Reference was made at the last meeting of the Liquor Effluents and Ammonia Committee of the Institution of Gas Engineers to the death of Dr. T. Lewis Bailey, former Chief Inspector of Alkali, &c., Works, which was announced in the *Journal* of January 11. High tribute was paid to the very valuable services rendered to the gas industry by Dr. Bailey in connection with the problem of the disposal of gasworks effluents. Dr. Bailey was, in fact, an original member of the Liquor Effluents and Ammonia Committee and of its predecessors and continued to be a member of the Committee until the spring of last year. Many of the early investigations of the Committee were conducted by Dr. Bailey and many of its recommendations were based on his knowledge and experience.

An exhibition devoted to French scientific instruments has been organised in conjunction with various French official bodies and will be held at the Science Museum, South Kensington, from February 9 to 26. It has been widely felt that, since pre-war days, there has been far too little opportunity for British scientists to become acquainted with current developments in France in the field of scientific instruments. The exhibits in the forthcoming exhibition will cover a wide field in the electrical, physical, and atomic fields and will help to make good the deficiencies resulting from the lack of personal contact during recent years. Many of the exhibits have been provided by the official bodies which correspond in France to the D.S.I.R. and other research establishments. Other exhibits have been provided by French instrument manufacturers.

1950 'Journal' Directory

THE 1950 edition of the *Gas Journal Calendar and Directory*, now in the hands of most subscribers, has been almost entirely re-set to meet the changed circumstances arising out of the nationalisation of the gas industry. As we wrote last week, it has not been possible with the continuous changes to achieve complete accuracy. Even where particulars were checked at the time of going to press there have been subsequent changes. The following alterations which have been notified since the directory was printed (together with the appropriate alterations relating thereto in the 'Personnel' section on pages 135-148*a* of the directory) should be noted:—

Page 21.—EAST MIDLANDS GAS CONSULTATIVE COUNCIL: Add Mrs. M. Larmour (Grimsby). Delete Alderman T. H. Simmons (Watford).

„ 21.—NORTH THAMES GAS CONSULTATIVE COUNCIL: Alderman T. H. Wheeler, J.P. (Horseferry Road, S.W.1), vice Mrs. J. Phillips.

„ 23.—SOUTHERN GAS CONSULTATIVE COUNCIL: 132, Old Christchurch Road, Bournemouth.

„ 23.—SCOTTISH GAS CONSULTATIVE COUNCIL: Add C. McCallum (Rutherglen, Glasgow).

„ 23.—WEST MIDLANDS GAS CONSULTATIVE COUNCIL: Add Councillor J. H. Lewis, M.B.E., J.P. (Harborne).

„ 27.—EAST MIDLANDS GAS BOARD: J. B. Leaman, *Coke Marketing Officer*; A. T. Raby, *Education and Welfare Officer*. Divisions: Sheffield and Rotherham: C. H. Plumtree, A.S.A.A., A.T.I.I., *Div. Accountant*. Notts. and Derby: F. A. Barrett, A.C.A., A.C.W.A., *Div. Accountant*. Leicester and Northants: C. A. Brain, A.C.A., A.C.I.S., *Div. Accountant*. Lincolnshire: W. H. Smout, A.C.I.S., A.A.C.C.A., *Div. Accountant*. (Lincolnshire Accountancy Centre address: 421, Grimsby Road, Cleethorpes.)

„ 29.—SWINTON AND MEXBOROUGH: Delete J. W. Brearley, *M*, retired.

„ 29.—WORKSOP: Delete E. M. Hutchinson, *M*, retired.

„ 31.—MARKET HARBOROUGH: Delete P. T. Harris, *M*.

„ 31.—KETTERING: P. T. Harris, *M*.

„ 33.—SLEAFORD: Delete S. Hands, *E & M*.

„ 37.—CHATTERIS: sales, 34 mill. cu ft.

„ 38.—IPSWICH DIVISION: R. S. Falkner, *Sales and Service Manager*.

„ 43.—CHESHAM DISTRICT: Delete R. S. Falkner, *M & E*.

„ 54.—GAS LIGHT DISTRICT, SOUTH ESSEX DIVISION: Delete W. A. Waters, *M*, retired.

„ 57-63.—NORTH WESTERN GAS BOARD: *Group Managers*: North Cheshire, J. Grayston. Wirral, J. Castle. Oldham-Rochdale, C. H. Bamber. Bolton-Radcliffe, T. Haworth. Fylde, J. G. O. Drake. Blackburn-Accrington, A. H. Nicholson. Burnley-Colne, H. D. Robinson. Bury-Rossendale, W. B. Harrison. Furness, W. Oldham. Kendal, T. Crowdy.

„ 68.—BLYTH DIVISION: T/N 727-728. K. Tindle, *Div. Accountant*.

„ 68.—BLYTH (undertaking): T/N 727-728. L. Nelson, *Unit Engineer*.

„ 69.—DURHAM: Delete R. W. Nicholls, *E & M*.

„ 95.—SOUTHERN GAS BOARD, WESTERN DIVISION: E. V. Quickenden, Sales Superintendent.

„ 99 and 102.—EAST GLAMORGAN GROUP: Convener, E. S. Long, vice D. I. Rowlands.

„ 101.—MYNYDDISLWYN: S. L. Filer, *E & M*, vice S. T. Monte.

„ 102.—ABERDARE: D. T. Phillips, *E & M*, vice D. E. West.

„ 102.—DOWLAIS: D. E. West, *E & M*, vice J. H. Jones.

„ 102.—RHYMNEY AND ABER, QUAKER'S YARD, AND MERTHYR VALE: D. I. Rowlands, *E & M*, vice B. Grainger, retired.

„ 103.—COWBRIDGE AND LLANTRISANT: E. Nock, *E & M*.

„ 103.—GLYNCORRWY: W. D. Thomas, *E & M*, vice T. J. Walker.

„ 104.—ST. DAVIDS: T. J. Morris, *E & M*, vice D. A. Nash.

„ 104.—NEYLAND: J. H. Daniels, *E & M*, vice R. Ruttley.

„ 104.—FISHGUARD: E. M. Gittins, *E & M*.

Page 105.—NEWTOWN (MONTGOMERYS): H. Evans, *E & M*, vice E. Nock.

„ 109.—WEST MIDLANDS GAS BOARD: *Coke Manager*: D. N. Maddocks.

„ 110.—LEEK DISTRICT: W. Brown, *E & M*, vice S. Tomlinson Jones.

„ 112.—STRATFORD-ON-AVON DISTRICT: S. Tomlinson Jones, *E & M*.

„ 122.—LESLIE (FIFE): J. N. Donnachie, *E & M*.

„ 122.—NEWBURGH (FIFE): Delete J. N. Donnachie, *E & M*.

„ 122.—ST. ANDREWS: Make 175 mill.; C.V. 400; Consumers 3,457; price 4/3 to 5/5. (The figures given in the *Directory* included Anstruther, previously belonging to St. Andrews but now run separately).

„ 165.—VICTORIA, B.C.: Sales 496 mill.; Consumers 8,796.

„ 173.—WOMEN'S GAS COUNCIL: Delete Mrs. W. M. Buchanan, *Organising Secretary*.

„ 181.—INSTITUTE OF FUEL: Delete Prof. C. H. Lander, Immediate Past President (deceased).

„ 181.—LOW TEMPERATURE COAL DISTILLERS' ASSOCIATION: Commander Colin Buist, M.V.O., R.N., *President*; A. Goodsell, *Secretary*.

„ A75.—PEEBLES & CO., LTD.: T/N Leith 35069 (not 33069).

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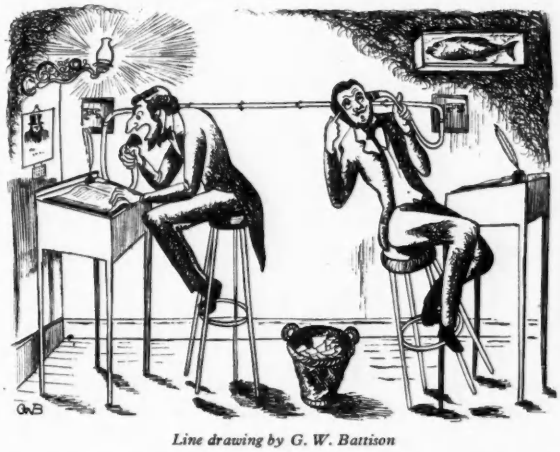
100 YEARS AGO

Tel.: GUT*ta Percha*

Of the many changes which the *Journal* has undergone in its long life, none has been more marked than the steady improvement in the appearance of its advertisements. Illustrations were well-nigh unknown, the pages resembling in some ways our present pages of classified advertisements. An examination of these items is interesting and sometimes amusing. For example, the *Journal* of February, 1850, brought a sharp reminder of the days when that mixed blessing of modern life, the telephone, was unknown, and other more primitive methods of communication sufficed to keep the wheels of industry turning. A forceful advertisement in this century-old issue called attention to that versatile product, gutta percha tubing. In addition to offering useful service for the 'conveyance of water, oil, chemicals, liquid manure, &c.,' and being 'peculiarly valuable for drain and soil pipes,' it was stated that 'the extraordinary power possessed by gutta percha tubing as a conductor of sound renders it invaluable for conveying messages from one room or building to another.' When it is appreciated that in case of any stoppage, 'an incision can be made with a sharp knife, and readily closed again by means of a warm iron,' this form of communication may yet have its admirers among those who have suffered from cut, damaged, and crossed telephone wires.



Line drawing by G. W. Battison

Scunthorpe Gas Profits

Scunthorpe Town Council received a demand from the East Midlands Gas Board for £20,556, the amount of profit the Council made on its gas undertaking during the two years before nationalisation.

Alderman John Tomlinson, disclosing the demand at the January meeting of the Council, described it as 'sheer robbery,' the profits having been turned over into the general rate fund and spent each year. To have to find the money now would mean levying an additional rate of 1s. 6d.

The Town Clerk (Mr. W. P. Errington) said he had taken counsel's opinion and it was against the Corporation. The Ministry of Health had refused to see a deputation about it. 'Unless there is a change of policy I am afraid that the money will have to be paid over,' he said.

A Call for Economy

A personal message from Colonel W. Moncrieff Carr, Chairman, to all employees of the North Western Gas Board, on the urgent need for economy has been issued in the form of a poster for display on all the board's premises. The text of the message is as follows:

'I have received from the Minister of Fuel and Power a letter calling my attention to the national need for financial restraint and economies in order to check the tendency of prices to rise.

'The Minister relies on this board to carry out all economies that are practicable in fulfilment of this policy.

'To ensure that we shall make a real contribution towards this end and not merely pay lip service to it I ask for the active help of everybody employed by the board.

'I appeal to everybody to co-operate in checking waste, organising work efficiently and ensuring that full value is received for every penny we spend.

'If we can steadily improve our efficiency we can lower our operating costs with consequent direct benefit to consumers and the nation.'

The Edinburgh and South East Division of the Scottish Gas Board has recently adopted a standard meter badge to be used throughout the area controlled by the Board. After discussing the matter with representatives of meter firms, Mr. D. J. Colvin, Divisional Controller, has made arrangements that the badge bearing the words 'Scottish Gas Board,' shall also carry the district code number, and a space has been left for the inclusion of the individual serial number of any particular undertaking.

An Interesting Lecture was given recently at the Wright Street premises of the Hull Group of the North Eastern Gas Board, to the sales and fitting staff, by Mr. James C. Thomas, Technical Representative of Main Water Heaters, Ltd., principally on gas storage water heaters. Particular attention was given to the constructional features, simple installation, and good facilities for maintenance of the Thermain No. 2 sink storage and the Thermain No. 15 multipoint storage water heaters.

Mr. Therm's Puppet Theatre, an ingenious entertainment feature designed by the North Thames Gas Board, attracted great attention at the Schoolboys' Exhibition staged at the Horticultural Halls, Westminster, during January.

Study of Technology

The Ministry of Education has announced that some 50 more post-graduate awards for the study of technology are to be made available in the session 1950-51 at selected universities and technological institutions in the United States. The first awards under this scheme were made last year. Some holders are now in the United States; the remainder are taking up their awards.

The cost of the awards is met from funds provided by the American Economic Co-operation Administration. The aim of the scheme is to produce a small group of well-qualified men who will return to industrial posts or universities and technical colleges in this country.

The awards are tenable initially for a minimum of one year, but it is hoped they will be extended for a further year. They are open to students who hold a good honours degree in pure science or technology, who have had at least two years' industrial experience, and who are now working in industry or research associations, or are teaching in universities or technical colleges.

A substantial part of the time will be spent in selected industrial establishments. The awards will provide for tuition fees, books, and travelling expenses in the United States and a maintenance allowance of $1,800 per annum. The cost of the return passage to the United States will be met from public funds. Successful candidates will be expected to leave the United Kingdom early in September.

Full details may be obtained from the Ministry of Education (F.E. Division 1), Curzon Street House, Curzon Street, London, W.1. The closing date for applications is February 15.

A Rich Coal 'Strike' in the Coal Board's biggest development scheme in Wales was made last week at Nantgarw, near Cardiff. The nine workable seams so far proved contain 19 mill. tons. In the immediate area are reserves estimated at 176 mill. tons. Commercial production will start in 1952 and four years later the colliery will be turning out 3,300 tons a day.

Diary

Feb. 3.—Scottish Junior Gas Association (Western District): 'Gas Conversions to Commercial Apparatus,' A. Walker (Motherwell); 'Difficulties in Handling Inferior Fuels,' G. W. Laing (Barrhead).

Feb. 10.—London and Southern Junior Gas Association: 'Heat and Water Vapour in Crude Gas,' F. E. Craddock (Research Laboratory, Fulham Works, North Thames Gas Board). Lecture Theatre, North Thames Gas Board, 178-180, Edgware Road, 7 p.m.

Feb. 11.—Midland Junior Gas Association: Dinner and Social Evening. Imperial Hotel, Temple Street, Birmingham, 6 p.m.

Feb. 13.—West Midlands Gas Consultative Council: Meeting, Birmingham, 2.30 p.m.

Feb. 13.—Women's Gas Council: Finance Committee, Gas Industry House, 12.30 p.m.

Feb. 14.—Scottish Junior Gas Association (Western District): Evening visit to Hoovers, Ltd., Cambuslang.

Feb. 14.—Midland Junior Gas Association: 'Civil Engineering Contracting for the Gas Industry,' W. H. G. Roach and R. Y. Stevens (Wm. Press and Son, Ltd.).

Feb. 16.—Midland Association of Gas Engineers and Managers: 'Making the Best Use of Existing Plant and Providing Extensions with Maximum Economy,' S. K. Hawthorn. Queen's Hotel, Birmingham, 2.30 p.m.

Feb. 18.—Yorkshire Junior Gas Association: Three Short Papers, F. E. Lodge, M. Williams, and R. Hodgson. Bradford.

Feb. 22.—London and Southern Junior Gas Association: Visit to Meter Repair Works.

Feb. 25.—Western Junior Gas Association: Joint Meeting with Wales and Monmouthshire Junior Gas Association. 'Mainlaying,' R. McAfee (Bath); 'Coke Oven Practice,' J. V. Drake (Bedwas); 'Comparative Performance of Iron Oxides,' A. G. Gaston (Bath).

River Polluted by Gasworks Effluent

East Midlands Gas Board Fined £25

THE East Midlands Gas Board was fined £25 and ordered to pay 50gs. costs at Stamford on January 21 for polluting the River Welland with the effluent from Stamford gasworks on September 2. The case was brought under Section 8 (1) of the Salmon and Freshwater Fisheries Act, 1923, and the charge against the board was 'that they did cause to flow into the waters of the River Welland liquid and solid matter to such an extent as to cause the waters to be poisonous or injurious to fish or the spawning grounds, spawn or food of the fish.'

Mr. Richard Elwes prosecuted for the Nene and Welland Fishery Board, and Mr. J. A. Grieves appeared for the Gas Board.

Mr. W. W. Sutcliffe, for four years water bailiff to the Nene and Welland Angling Association, said that at the end of August or the beginning of September the water was in a very good condition. It was lower than its ordinary summer level—there had been a lack of rain—but there was nothing abnormal about the low state of the water.

On September 2, however, fish were caught in the weeds and lay on the banks. The water was a very dirty brown, and where there was no depth at all it was almost black. It was inky in colour and had a chemical smell.

'I went down-river towards Tallington for a about a mile; there were dead fish along all that stretch of water, in the water and on the bank,' said Mr. Sutcliffe.

Mr. L. G. Wiles, Fishery Inspector to the Fishery Board, said he took three samples of water from the river and one from the effluent emerging from the gasworks. He also went to the sewage farm at Hudd's Mill and inspected the effluent flowing into the river. It was quite clear, he said.

'I inspected the river above the outlet from the sewage works and the same conditions applied there as at Uffington Bridge. There were several fish dead also,' he continued.

Mr. Elwes: Did you arrive at any opinion as to whether the sewage works had anything to do with the condition of the river?' 'I reached the opinion that it had nothing to do with the condition at all.' Mr. Wiles replied. Referring to his visit to the gasworks he said there were traces of tar in all four catch-pits at the outflow. Their general condition was not good and showed lack of attention.

Expert Evidence

Both sides called scientific evidence.

Dr. Solomon Greenburgh, public analyst, for the prosecution, said that the sample of water taken from a point 100 yd. above the gasworks was reasonably clean river water and its content of dissolved oxygen was 90.8% of the saturation value.

At a point 100 yd. below the gas works the dissolved oxygen content fell to 58.7%, while the sample taken at Uffington Bridge showed a dissolved oxygen content of 12.2%, which was insufficient for fish to respire.

Dr. Greenburgh said it took time for an effluent to have its full effect on a river. 'It does not mean that at the point of discharge, or 100 yd. below, it will be at its worst. It may go further down, two or three miles,' he said.

Mr. Grieves said: 'If it be a fact that the effluent from the sewage works is discharged upstream above where the third sample was taken, it is impossible, is it not, to eliminate injurious matters coming from there?' Dr. Greenburgh replied: 'Unless I have a sample from that effluent it is impossible to eliminate that as a source of pollution.'

Sewage Effluent Blamed

Dr. Michael Barash, scientific adviser to the East Midlands Gas Board, for the defence, agreed that the gasworks' effluent was dangerous to fish in itself, but said it was not dangerous when diluted by 1,000 to 1,700 times on introduction to water. Sewage was capable of reducing the quantity of dissolved oxygen in water, and a gasworks of the size of that at Stamford was not capable of adopting at a reasonable cost better practicable means of treating effluent.

Mr. Bernard Clarke, Manager of the South Lincolnshire Division of the board, said he became manager of the Stamford gasworks in 1927 and since that time the same method of manufacture had been employed there. He had never previously had any serious complaint about the effluent from the works polluting the river.

Mr. Grieves: Mr. Wiles has told us about the tar floating on the top of the catchpit. Is there anything surprising about that?—That is what the catchpit is there for.

After questioning Mr. Clarke about the possibility of the sewage effluent having a bearing upon the condition of the river on the day in question, Mr. Elwes went on to ask: 'Are you suggesting that the sewage effluent has anything to do with it?'—Yes, sir.

Mr. Elwes: That could have been easily tested?—Yes, sir.

Mr. Elwes: Have you done anything to bring any affirmative evidence in support of the theory that the sewage effluent might be responsible?—No, sir.

Mr. Clarke told Mr. Elwes that he considered the people who were working the gasworks' plant were up to their job and sufficiently numerous.

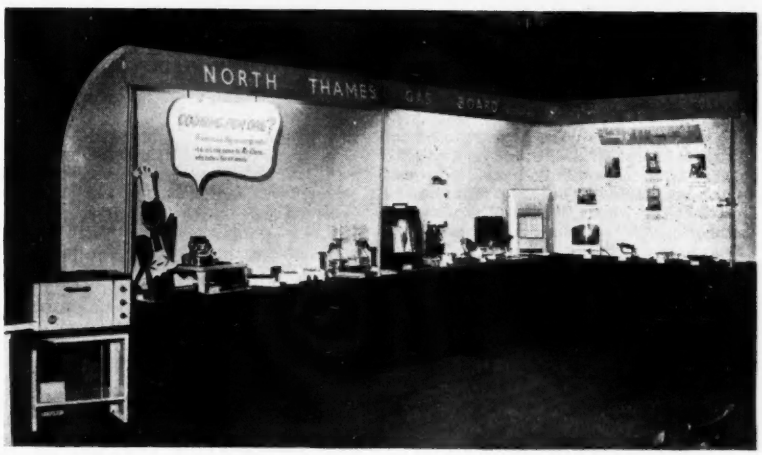
Mr. Grieves submitted that the pollution, if it had occurred at all, had occurred once and once only in the history of the gasworks, which had been in existence since 1823. They had been making gas by the same method all through the years and nothing like that had happened before.

The pollution was observed two miles below the gasworks, and no-one could eliminate the possibility that it had come from another source altogether.

Major S. B. Edinborough (the Chairman) said the magistrates were unanimous in their decision that the effluent from the gasworks caused the pollution.

Coal Output last week declined slightly from 4,474,100 tons in the previous week to 4,421,900 tons. In the week ended January 14 the total number of workers fell by 400 to 708,800, including the loss of 200 face workers. At gasworks last week 11,742.9 mill. cu.ft. of gas were available, against 11,315.5 mill. cu.ft. in the week before, and 1,085.9 mill. units of electricity, against 1,025.3 mill., were sent out over the same period.

COOKING FOR ONE



The North Thames Gas Board's display stand in the main conference room, Ministry of Food, Portman Court, Portman Square, London, W.1, arranged in connection with the 'Cooking for One' demonstration given on January 16. The demonstration was the first of a series of six weekly demonstrations which have been organised by the Food Advice Division of the Ministry of Food for the Ministry's staff.

Midland Juniors Visit B.T.H.

THE Midland Junior Gas Association visited on January 26 the Rugby works of the British Thomson-Houston Co., Ltd. In the limited time available it was not possible for the 60 members to do more than visit a proportion of the great works which covers 140 acres and has over 2 mill sq. ft. of floor area. In parties of 15 the visitors first inspected the turbine factory, which is one of the buildings over 1,000 ft. long. The work here covers a wide range of steam compressors, turbines, blowers, compressors, and exhausters. Among the special machines seen were a planing machine capable of handling work up to 13½ ft. wide and 12 ft. high with a 25 ft. stroke, and a horizontal turbine-casing boring machine of similar proportions. The factory includes an enclosed testing chamber for rotors with the recording instruments outside. The visitors were particularly impressed by a rotor slotting machine of German design and manufacture. High speed notching of cores at a rate of from 250 to 650 a minute was watched in an adjacent shop.

A view of the sub-assembly section of the motor factory at Rugby, which produces medium sized three-phased a.c. commutator motors.

Of interest also was the unusual, if not unique, layout of the foundry. Designed as a three-storey building, the ground floor is utilised for machine moulding of castings for the smaller sized motors and domestic appliances. The handling of the castings is facilitated by the extensive use of roller conveyors. The higher floors of the foundry are devoted to the production of iron castings up to 10 cwt. and castings in non-ferrous metals.

Heavy Plant Manufacture

The generator factory for the manufacture of rotary converters, large electric motors, and transformers proved to be another 1,000 ft. building, at the north end of which all classes of transformers up to a 1 mill. volt testing unit are built. Outside the party were shown a 40,000 kVA transformer awaiting despatch. From the generator factory the tour passed on to the first section of the heavy plant factory to be completed. This, in particular, gave an impression of spaciousness, a characteristic of all the works factories, enhanced by its exceptional height which is needed for the accommodation of some of the largest transformers, generators, and electric motors. The plant included an 800 ton press for consolidating field coils, a 10 ft. high planing machine with a 30 ft. stroke, and a special 25 ft. diameter boring mill.

The motor factory was of equal interest to members with its modern machine tools for the production of medium-sized motors, familiar to many on their undertakings.

Among the equipment seen were the casings and impellers of two gas boosters being built for Beckton. The first of these, a 3 mill. cu.ft./hr. booster, dismantled after testing, was in process of being despatched. The second, with a capacity of 2 mill. cu.ft./hr., will shortly be built on the test bed. It was also interesting to learn that among other equipment for gasworks on order with B.T.H. is a 2 mill. cu.ft./hr. turbine-driven booster for Fulham, and two similar machines, of 1 mill. cu.ft./hr. capacity each, for Bromley in the North Thames area.

Fabrication Methods

A feature of the works is the extensive use of fabrication in the manufacture of all types of equipment. Iron and steel castings have been replaced by this form of construction which employs plate and bar material, and a striking example of the work of the fabrication factory is the manufacture of large steam turbine casings. Adjoining this factory is a stress relieving furnace for annealing fabricated steel assemblies. The furnace uses producer-gas and is capable of accommodating the largest fabricated components made.

Among the smaller shops which were inspected were the tinsmiths' shop, the moulding shop, and the infra-red room where two Matthew Hall gas tunnels were seen in operation baking a variety of small components which were carried through on a slow-moving conveyor belt.

At the conclusion of the tour the party were entertained to tea in the head office. Mr. **C. A. Hall,** Manager of Industrial Sales of the Company, expressed on behalf of the Company their appreciation of the visit from an association of the gas industry. He welcomed the spirit of co-operation between the two industries, and mentioned that his Company used a large proportion of the total make of the Rugby undertaking. Mr. **S. C. Bentley** (President), in reply, thanked the Company for what had been a most interesting and instructive visit.

London Juniors' Visit

The members of the London and Southern Junior Gas Association had an interesting outing on January 25, when they visited what is claimed to be the world's largest toy factory at Merton, London—the Tri-ang works of Lines Bros. The Juniors were welcomed by Miss Jean Arthur, deputising for the Directors, who were entertaining a party of Americans, presumably concerned with dollars and not therms.

In small groups the Juniors were conducted round the factories by capable guides and in a tour of inspection lasting 1½ hours saw some amazing methods of mass production. Some 3,000 people are employed turning out prams by the thousand and toys by the hundred thousands, and of these a large percentage are marked 'For Export.' Gas plays an important part in the factories and is used in paint-drying, tempering, die castings, and various other processes. It is also used in the three canteens for cooking and in the staff canteen for heating as well.

The party was entertained to tea and Mr. **A. H. Savill**, President of the Association, thanked the Directors of Lines Bros. for allowing the members the opportunity of visiting the works.

All Records were Broken by the Edinburgh gas undertaking on January 26, when the gas output reached the highest figure of all time, 23,525,000 cu.ft.

The First Children's Party organised by the Eastern Gas Board (Cambridge District) Recreation Club since becoming nationalised, and held at the Co-operative Hall recently, proved as popular as any of those which for many years were a New Year feature under the former regime. Nearly 100 young folk were entertained at tea, followed by a full programme which occupied the remainder of the evening. The children were joined at teatime by Mr. Hunter Rioch (General Manager, Cambridge Division, Eastern Gas Board) and Mrs. Rioch; Mr. E. H. Winch, Engineer and Manager, No. 1 (Cambridge) Group, and Mrs. Winch.

Hard Selling at Hotelympia

And a Tour de Force for Gas

WITH the added significance of a growing tourist trade, the Hotel, Restaurant and Catering Exhibition made its second post-war appearance at Olympia on January 25. Hotelympia—as it has become universally known to hoteliers and caterers everywhere—is unquestionably the largest trade exhibition ever staged for this industry. But it is much more than a gigantic shop window; it has become a concrete symbol of the progress and endeavour of the nation's fourth largest industry and biggest dollar earner. Until it closes on February 3 visitors will have an opportunity of seeing many new appliances, and in this connection it is important to note the changed tenor of this 1950 exhibition. Delivery delays are negligible, and selling is really necessary to obtain results. The 260 commercial exhibits are, of course, the main attraction, but they do not represent the entire scope of Hotelympia. This year gas plays a larger part than ever.

A notable feature of the ground floor is the Hall of Opportunity, which with its table d'honneur (revived for the first time since the war) and its model restaurant, licensed bar, milk bar, and reception office staffed by students from hotel schools and technical colleges is a unique feature which reveals the strides now being made in training the hoteliers and caterers of the future.

In the demonstration theatre instructors and students will give practical demonstrations every morning and afternoon. These demonstrations, which have been organised by the National Council for Hotel and Catering Education, are given in the model kitchen laid out by the North Thames Gas Board, for which equipment has been loaned and installed as follows: Gas Council (gas and water services), Benham & Sons, Ltd. (pastry oven, range, salamander), Parkinson Stove Co., Ltd. (boiling table and stand), Electrolux, Ltd. (refrigerator), De La Rue, Ltd., Potterton Gas Division (water heater).

The list of associations represented is a long one. The following are some of those having stands: British Hotels and Restaurants Association, the British Tourist & Holidays Board, Caterers' Association of Great Britain, Catering Equipment Manufacturers' Association, Hospital Caterers' Association, Industrial Catering Association, Industrial Catering Managers' Association of Great Britain, National Association of Restaurant Engineers, and the National Caterers' Federation. The Tea Bureau is also well represented.

Trade Stands

The following review of exhibits is intended to provide a more or less complete picture of gas representation at this large and virile exhibition. The list of exhibitors showing gas equipment is a long one, and readers will, we hope, derive both interest and assistance from these notes, which include several firms familiar to, but having only indirect association with, the gas industry.

Stand No. 182.—An extremely wide range of gas equipment is exhibited by **Adams & Son (Engineers), Ltd.,** but particular mention might be made of the handsome hot cupboard with flush top bain marie. This model, No. 212, has insulated door handles, and the doors can be lifted from their steel tracks for cleaning. The top section is fitted with a specially designed dry heat bain marie with thermostat control. The pans are of aluminium, are supported in cast aluminium frames, and have flush handles, allowing the hot cupboard to be used as a cold service counter when heat is not required. Also shown are fish frying ranges, service counters, and a neat counter bain marie.

Stand No. 57.—**Albright & Wilson, Ltd.,** display on their stand some of the advantages of Calgonite, the calgonised detergent for washing up, &c. It is made in three grades, 'M' for machines, 'H' and 'XL' for hand. These products are shown to solve economically the problems of grease, hard water film, and lime deposits which clog sprays and the moving parts of dishwashing machines, and ensure absolute cleanliness of crockery and glassware. Other displays deal with the applications of calgonised detergents in cleaning dairy utensils, tea and coffee urns, beer engines and pipes, refrigerators and catering and food manufacturers' equipment where freedom from dirt and grease is essential.

Stand No. 213.—**Automaticket, Ltd.,** are showing the two modern systems of cash control in the catering trade. For industrial canteens, model 'H' ticket issuing and recording machines are advocated for rigid cash control, speedy service, and analysis of food entitlements. For hotels and restaurants, the Automacheckit duplicate receipting machine is recommended for issuing kitchen vouchers and waitress bills, speeding service, ensuring accurate check on waitress sales, and giving a quick analysis of sales for food entitlement.

Stand No. 118, 119 and 120.—On an excellent stand **G. F. E. Bartlett & Son (Metal Workers), Ltd.,** exhibit a very wide range of equipment. Among the items deserving particular comment might be mentioned a very neat and well constructed jacketed urn with a good gas burner located in the integral fret stand. The 'Bell' automatic water boiler and café set is well known and models boast several refinements over those at the last exhibition. An outstanding item is a combination counter bain marie and pastry warming unit, which consists of an outer casing into which is fitted a water bath or bain marie pan covered by a fixed plate having apertures to take containers. The heat also circulates round three drawers on the right of the apparatus; the appliance is thermostatically controlled.

Stand No. 101/2/3/4.—One of the finest stands in the show, that of **Benham & Sons, Ltd.,** boasts several new features. In particular attention should be drawn to a new deep fat fryer unit, the Mk. III, which can be supplied either as a separate appliance or can form a unit of the solid top range. Economical running is a strong point and the fryer has a new method of heating. Near the bottom of the pan are heat exchanger tubes or flues, through which the combustion products pass, the heat being transferred to the oil. The heating surface is thus increased three times, while the actual surface temperature is reduced. Another new item is an entirely new design of the Mk. III. solid top range.

Stand No. 80/1.—All types of electrical timing equipment are featured by the **British Vacuum Cleaner & Engineering Co., Ltd.,** including master clocks, slave clocks, timing systems, programme instruments, time recorders, relays and ancillary timing equipment. All types of loudspeakers and amplifiers ranging from 10 to 50 watts output, signal generators, microphones, besides rack assembles comprising radio sets and gramophones are represented. In addition, the Magneta loudspeakerphones for inter-office communication are shown, and also B.V.C. light industrial portable vacuum cleaners.

Gas-Fired Ovens

Stand No. 111.—Interesting exhibits on the stand of **W. E. Burnell & Sons, Ltd.,** include the tri-deck gas-fired and double-deck coke-fired ovens. Both models are completely portable, but for larger establishments, works canteens, &c., attention is drawn to the 4 ft. × 4 ft. double-deck ovens, gas or coke-fired. Each baking chamber in every model is a sealed compartment free from fumes and flue gases, and all ovens are soundly constructed.

Stand No. 207.—Winning more new friends, the **Cona Coffee Machine Company** presents the usual range of models, but includes one new one, the 'Console.' This is equipped with four glass sets, each of 3 pints capacity, giving a total output of 20 gal. of freshly made coffee per hour. Holding frames are fitted to ensure stability, and the method of sealing is by means of an odourless rubber fitment. It embodies four special type gas burners, the construction of which makes it impossible for the flames to light back, thus allowing them to be reduced to a minimum. Two chromium plated twin funnel holders with removable drip trays, four rubber mats, and a coffee measure complete the equipment.

Stand No. 28/9.—The **Crittall Kitchen Equipment Co., Ltd.,** is, of course, well known for heavy duty cooking apparatus. Apparatus displayed includes ranges, roasting ovens, steaming ovens, steam jacketed boiling pans, stockpot stove, grill, hot closets and boiling table. The stand is fresh and attractive in appearance and is well staffed.

Stand No. 12/13.—The Plastics Division of **Thomas De La Rue & Co., Ltd.,** presents a neat and harmonious stand which is divided into two sections, showing a typical kitchen and bar. The former consists of a Staines 'Streamline' unit, a section of which is made with buff Linette and green Formica surfaces. The floor is the new De La Rue plastic flooring in mottled grey. Walls are panelled in cream Traffolyte, and carry a clock with buff Linette Formica face. The bar section, joined to the kitchen by a serving hatch, contains a bar with maroon Formica top and front in blue with inlaid pattern and a standard café table. Wall surfaces are fitted with aluminium strip and are of Traffolyte and Woodgrain Formica. In the bar is a display unit which shows inlaid designs, Traffolyte labels, methods of fabrication and sample Formica trays.

Fish-Frying Equipment

Stand B, East Gallery.—An excellent display of fish frying equipment is shown by **Driver-Adams Services, Ltd.,** including an interesting new sales service counter. Manufactured in stainless steel, vitrolite and plastic, the latter embraces in one unit a chipped potato container of 4 cwt. capacity, adequate shelves, cash drawers, container for oil, another for batter with a draw-off tap, a fish compartment with three trays and a glass-enclosed stainless steel washing bowl.

Stand No. 23.—**Euk Catering Machinery, Ltd.,** is a subsidiary of Steel & Co., Ltd., and on this stand the firm exhibits a considerable range of catering machinery and equipment, including fish frying ranges, hot closets, and bains marie. A second stand will be found in the East Gallery, featuring fish fryers. One is an impressive three-pan gas-heated wall type model finished in stainless steel and vitrolite, complete with back panel and fitted with steel safety burners.

Stand No. 189.—An excellent display is that of **James Farquharson & Sons, Ltd.,** a firm which has a century of experience behind it. The exhibits at this exhibition include not only cooking apparatus, service counters, water boilers and insulated urns, but also a range of trolleys and similar tea distribution equipment which is one of the firm's specialities.

Stand H, East Gallery.—Fish fryers are the particular concern of **Frank Ford,** and this stand gives several examples of the Ford range. Of particular interest is the Vanguard, a well-constructed three-pan gas range with thermostatic control and radiant studded pans. The topwork, which is particularly attractive, is made from Firth's 'Staybright' stainless steel.

Stand No. 15/16.—Another very attractive exhibit is that of **W. N. Froy & Sons, Ltd.,** whose range of equipment covers not only catering appliances, but all types of fireplaces, sanitary fittings, &c. Of the former, an interesting new arrival is the 'Brunswick' boiling pan, which has a rectangular exterior and several attractive features. Another new appliance is an impressive steaming oven, stoutly constructed, and with a drip trough fitted to the front and an automatic water feed on the side. Thermostatic control is optional.

Stand No. 1/4.—Particularly featuring cafeteria service counters, **Gardiner and Gulland, Ltd.,** contribute a remarkable display, the most interesting items being some excellent hot closets. The 'Alacarte' model has a wet heat top bain marie, the entire top equipment being immersed in a steam bath, and a dry heat hot closet. Heating is by a single burner and embraces a new safety multiple gas cock control ensuring that the pilot light is on before the burner can be lit. Thermostatic control is fitted and the appliance has automatic water feed. The top is interchangeable with a minimum of effort.

Stand No. 222.—**Gilbert Ovens, Ltd.,** exhibit part of their range of baking ovens, the most interesting item of which is the new 'Regent,' a small baker's or caterer's oven suited for the beginner, or an auxiliary oven. The oven is fitted on raised feet and may be erected on any foundation or floor. It is constructed on an internal and external shell suitably packed with non-conducted materials for the retention of heat. The baking chambers are 3 ft. by 2 ft. internal measurements, or 2 ft. by 3 ft. as desired. The doors are of cast aluminium or stainless steel, and the latches and hinges are of patent design.

Stand No. 149.—**Wm. Green & Co. (Ecclesfield), Ltd.,** have a neat corner stand which features some attractive equipment. In particular, there is a steaming oven of clean design, with concealed hinges and sliding bolts. A gas burner with separate gas and air adjusters is fitted under the water well, and an automatic gas regulator enables a saving to be made of up to 50% of gas. The new fish fryer is also of neat design, as is the griller, which has gas burners with fire brick deflectors fitted in the top with separate control taps. Also shown is a 'Heatflow' cooker.

Water Boilers

Stand No. 6—**Hodgkinson & Company** have a small but effective stand which boasts a handsome range of equipment. The only completely new appliance is an excellent pie-warmer which is operated by steam from a café boiler. Neatly constructed and well finished, this piece of equipment is likely to be well received. The well-known range of automatic self-feeding water boilers and café sets exhibit certain refinements of design, and there is a novel 'Restaurant' type fish frying range with hot storage accommodation beneath. Counter bains marie, grillers, and toasters are also shown.

Stand No. 86 and 105.—An excellent display of equipment is to be found on the exhibit by **Jackson Boilers, Ltd.** Specialising in tea-making apparatus, this firm is well known for its range of self-feeding water boilers and café fountains. A newcomer to this range is the C.F.2 café fountain, which is thermostatically controlled and can deliver four pints of boiling water per minute, or, according to the capacity of the appliance, 240, 360, or 47 pints per hour. Other appliances include a heater for general use or dish washer service, the 'Quicktea' portable tea maker and the 'Teatomaton' with divided container and two infusers.

Stand No. 30.—Heavy duty kitchen equipment in considerable variety is exhibited by **Mabbott & Co., Ltd.** It is not possible to list all the items shown, but mention might be made of the well constructed fish frying ranges, confectioners' ovens (these are a particular speciality of the firm), hotcupboards, vegetable boiling pans, steamed pudding cabinets, and water boilers.

Stand No. 181.—Occupying a large stand in the gallery, **R. & A. Main, Ltd.,** presented several additions to their wide range of products in the catering field. In particular mention must be made of a compact deep fat fryer which has a heavy cast pan, and a cool crumb-well which is an important feature. Perhaps the most impressive exhibit is a 'P-D' plating-up installation—a 'flow assembly' apparatus with heated travel surfaces and small, frequently-replaced food storage containers which ensure rapid operation and minimum loss in the nutritive value of the food. The example shown is finished in black and cream enamel and is extremely attractive.

Café Sets

Stand No. 184.—Specialists in hot water apparatus, **Maxol Heaters Ltd.** combine on their stand café sets and boilers with the familiar S.I. sink heater. The café sets, which are constructed with brazed joints, are beautifully finished. The coffee and milk urns are independently heated by a patented burner, and each urn is thermostatically controlled.

Stand No. 74.—Also well-known manufacturers of café sets, **Minimax, Ltd.** exhibit a pleasing range of equipment suitable for many varied installations. The Minimax combined tea and coffee unit is particularly impressive, and exhibits a number of recent refinements. Equipped with a 15-in. boiler with an output of 350 pints of boiling water per hour, the appliance has two steam injectors and is heavily chromium plated.

Stand No. 180.—**John Mollett, Ltd.,** have a remarkable display of auto-steam appliances the most attractive of which is an auto-steam bain marie which was introduced at the last exhibition. This is a neat piece of equipment and is notable for the effective hoist, operated by the foot, which raises or lowers the plates. By this means hot food can be served on hot plates without stooping, bending, or turning. Also shown is a white enamel hot cupboard with a patent Pressure-stat, which, it is claimed, is sensitive to less than 1/100th lb. steam pressure. Operation costs are stated to be less than one farthing an hour.

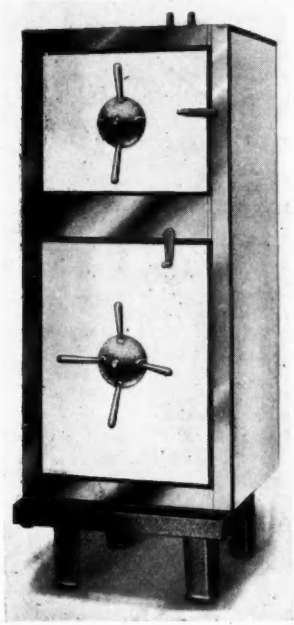
Stand No. 5.—Robust construction and pleasing appearance are features of the selection of heavy duty equipment shown by **Moorwoods, Ltd.** The following appliances are entirely new: A vegetable boiling pan of 20 gal. capacity, a double oven range, a two-pan fish fryer, and a 6-ft. hotcupboard. Vitreous enamelling and chromium plating are both extremely good.

Stand No. 70.—Economy and mobility might be taken as the keynote of **Charles Portway & Son Ltd.** whose ovens, both gas and solid fuel, are to be seen on this stand. Both types are sectionally made to facilitate handling. A luminous burner is fitted, with only one control and automatic air intake. Moreover, a new simple method of ignition by pilot jet has now been incorporated.

Stand 177.—January 25, when the exhibition opened, was extremely cold, and this fact no doubt increased the attraction of the **Radiant Heating Ltd.** stand, which owing to the operation of the

firm's range of space heaters, was comfortably warm. Other attractions included the three infra-red appliances featured at the recent Building Centre demonstration, notably the salamander with its overfired grill and rapid heaing up, the vertical grill which cooks both sides at once, and the thermostatically controlled bread toaster.

Stand No. 151/2.—On the **Radiation (Large Cooking Equipment) Ltd.** stand, one of the most interesting items, shown for the first time, is a pressure steaming oven operated by live steam at five pounds pressure. It is available with compartments in three heights. While all are 18 in. wide and 24 in. deep, the No. 2 oven is 16 in. high and accommodates three baskets, the No. 4 oven is 28 in. high and takes six baskets; and the No. 6 oven is 40 in. high (eight baskets). The model at the exhibition consists of a No. 2 unit superimposed on a



Pressure steaming oven by Radiation (Large Cooking Equipment), Ltd.

No. 4 unit, giving an overall height of 5 ft.—the same as the height of the No. 6 oven. Also shown is a service counter 24 ft. long and divided into hot and cold sections, the former being fitted with a bain marie and containers. On either side a three-unit Grosvenor range and a double-oven Chester range are displayed. Other gas-heated appliances include a two-tier 30 in. wide confector pastry oven, a Kendal roasting oven, a Keswick vegetable steamer, a Savoy griller 'C' pattern on combined stand and hot-closet, and a No. 1324 stockpot stand.

Stand J, Gallery.—Specialists in fish frying equipment, **J. Rouse (Oldham) Ltd.** exhibit a wall frying range which embodies the Rouse 'controlled turbulence' heating system, heated by a new type of burner and thermostatically controlled. Also shown is a restaurant or kitchen fish frying range which reveals an equal regard for good construction and finish.

Stand No. 48/9, 72/3.—The outstanding item on the stand of **Rowe Bros. & Co., Ltd.** is undoubtedly the three-in-one unit, the bottom section of which is a hot cupboard and the upper section of which is both steaming oven and fish frying unit. The whole appliance is remarkably compact, measuring 3 ft. wide by 4 ft. 3 in. high by 1 ft. 8 in. back to front plus handwheel. Finished in cream

Combined hot cupboard, steaming oven, and fish frying unit by Rowe Bros. and Co., Ltd.

vitreous enamel it makes a strong appeal to the small scale caterer and is one of the most novel items in the exhibition.

Stand No. 19, 33/4.—Occupying a prominent position, the stand of **W. M. Still and Sons, Ltd.** presents in attractive fashion the wide range of boiling water and coffee making apparatus for which the firm is well known. Working apparatus is arranged in an exhibition room, and, in addition, the impressive Model 1B dish washing machine is also operating.

Stand No. 7/9.—**James Stott & Co. (Engineers) Ltd.** have a large and effective stand which contains several new appliances. The most impressive is a prototype cafeteria service counter with hot cupboard, bain marie top, a refrigerator unit, and café set. Another interesting newcomer is an American type non-pressure coffee perculator, supplied in either circular or octagonal form. The 'Regula' patent water boilers and café sets all fully automatic, are also featured, together with a representative range of food steamers (of which appliance Messrs. Stotts manufacture a larger range than any other one firm), and hotcupboards, &c.

Stand No. 122/3.—**Sumerling & Co., Ltd.**, exhibit their well-known 'Bunhill' fountain set which appears this year with a number of refinements, and a wide range of water boilers and other appliances concerned with beverage production. Among the most attractive items is the 'Table d'Hote' hot cupboard which is designed for the service of all the hot dishes on a table d'hote menu. On the service top are two carving dishes, two soup and gravy pots, entree, vegetable and sweet containers, and two sweet sauce pots. The large hot cupboard is fitted with a special warming oven constructed for wet steam heat and the overhead hot cupboard is useful for small dishes. It is constructed on the self-generating steam principle with one atmospheric burner.

Fuel Research Project

Two Marshall Plan research projects which may lead to better and cheaper fuel supplies in British factories and homes were announced last week by the Economic Co-operation Administration Mission to the United Kingdom. One provides for a British scientist to take part for at least one year in a current United States experiment on the underground gasification of coal. (*Journal*, January 18, p. 145.) The other will take another British expert to the United States and Canada for a six weeks' study of gas-turbine development.

Dr. E. T. Wilkins, principal scientific officer of Britain's Fuel Research Station, will spend a year in Alabama, where the United States Bureau of Mines and the Alabama Power Company are jointly sponsoring the coal experiment. For the gas-turbine study, Mr. T. F. Hurley, also of the Fuel Research Station, will arrive in the United States early in April.

101 Years' Service

With the retirement on December 1, 1949, of Mr. P. E. Dunn, meter tester and repairer with the Dover undertaking, a record has been established which is probably unique in the annals of the undertakings comprising the South Eastern Gas Board. It is a record of long service made by two generations of one family—Mr. G. H. Dunn, who started at Dover when the works was situated on the sea front, and retired at the age of 70 after 50 years' service, and his son, Mr. P. E. Dunn, who completed 51 years with the same undertaking. Thus father and son have, between them, a total of 101 years' service to their credit, a remarkable achievement, made even more remarkable by the fact that they both spent all their working days in the distribution department.

Mr. P. E. Dunn commenced as a fitter's mate in 1898. He became a fitter soon afterwards and subsequently took up the duties of meter tester and repairer. He served with Artillery Volunteers from 1900—transferring to the Territorials after reorganisation—until 1919. He served in the 1914-1918 war in India, and was a member of the Special Constabulary from 1936-1939.

The Directors of Metropolitan Gas Meters, Ltd., entertained 80 of their employees' children to a New Year party on January 14. The Lord Mayor of Nottingham, Alderman W. Sharp, who has been employed by the Company for the past 45 years, was present in his official capacity, accompanied by the Lady Mayoress, and they assisted in entertaining the children, each of whom received a present with the compliments of the Company.

CARBONISATION BY ELECTRICITY

***EDITOR'S NOTE*:—The following is an abstract from the *Journal of the Institute of Fuel* of a paper by O. Jenson (Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Oslo, Norway) at the United Nations Scientific Conference on the Conservation and Utilisation of Resources held at Lake Success, N.Y. The author deals with a new electric process for the carbonisation of non-coking bituminous coal.**

NORWAY'S water power resources were estimated at about 80,000 mill. kWh yearly at minimum flow, but recent investigations have appreciably increased this figure. It is of particular interest to the electrochemical and electrothermal industries to ascertain how much low-cost, undeveloped power is still available at ice-free coastal harbours in blocks of 200,000 to 400,000 kW for each particular location.

Pre-war construction costs were approximately $100 per kW-year, which gave power costs of about 0.1 cent per kWh delivered at the factories. Current construction costs would raise this figure to about 0.15 to 0.25 cent per kWh delivered. As this power is available on a continuous, yearly basis at ice-free coastal locations with good oversea connections, conditions would appear to be favourable for a vigorous development of electrochemical and electrothermal industries in Norway. This report deals with the proposed carbonisation of Spitsbergen coals.

A conservative estimate of the Spitsbergen coal reserves gives 8,000 mill. tons of coal of various types. Of particular importance are large deposits of bituminous coals of tertiary age which are now being worked by Norwegian mining companies at Longyear City and the Svea mine. The Longyear City coals have the following approximate composition:—

Moisture	0.70%
Ash	5.44%
Volatile matter	39.60%
Fixed Carbon	54.26%
Calorific value, B.Th.U./cu.ft. ...	13,000 (min.)

Their ultimate analysis is: C, 78.90%; H, 5.38%; N, 1.50%; S, 1.90%; O, 6.18%. The Svea mine coals show a similar composition except for a somewhat higher ash content.

Pre-war freight rates for coals from Spitsbergen to Norway were no more than from the Polish ports or from the east coast of England. Spitsbergen coals therefore sold at competitive prices on the Norwegian market. The pre-war coal output from the Spitsbergen fields, however, never exceeded 300,000 to 400,000 short tons per annum, *i.e.*, it was only about 10% of Norway's coal and coke consumption. This low production was due to various causes:

(1) Since the underground temperature in the Spitsbergen mines is −2°C. the coals are frozen and disintegrate completely on thawing out, so that they are not very suitable for ordinary methods of firing. The ash also has a detrimental effect on acid firebrick owing to its low fusion point and alkaline reaction.

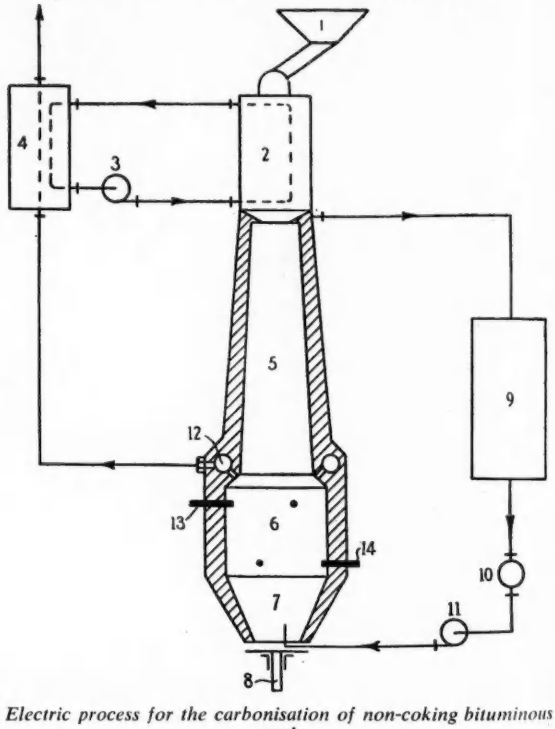
(2) The coals are unsuitable for coke manufacture in the usual type of coke ovens. The coke is highly porous, of low mechanical strength, and disintegrates badly during transport and storage.

In order to utilise Spitsbergen coals to the extent justified by the large reserves, new methods of treatment must be applied, and it is natural in Norway to associate these with further utilisation of the country's large water-power resources. The Norsk Hydro-Electrisk Kvaelstofaktieselskab, in co-operation with the Norwegian Government, commenced work during the recent war on a new electric process for the manufacture of high-quality coke from Spitsbergen coals. This work has now progressed to the stage where a plant of industrial size can be built.

Carbonisation Process

The coal is crushed, and either the pulverised coal is briquetted at high pressure (2,500 kg./cm.^{2}) in a ring-roll press (a modification of the type used for brown coal) or somewhat larger coal is briquetted at a lower pressure of 100 to 200 kg./cm.^{2}, using concentrated sulphite lye as a binder.

It is known that if coal briquettes are carbonised at a sufficiently low rate, they can be formed into strong and dense high-temperature coke of high reactivity, without fusion, deformation, or cracking. The resulting low-temperature tar should provide Norwegian industry with a welcome raw material. Utilisation of the gas is a more difficult and complex problem. Since cheap hydro-electric power is available in most parts of the country, gas consumption is small, even in the larger cities. This is the main reason why the country has so far been unable to meet more than about one-tenth of its large coke consumption by domestic production. A coke production corresponding to the country's requirements would give a gas production so large that only a synthetic chemical industry primarily for motor fuels, could provide a market for it. It would be logical then to attempt direct production of the most suitable gas mixture from the coking process.



Electric process for the carbonisation of non-coking bituminous coal.

1, *Briquette bin with gas-tight feeder for charging.* 2, *Preheater for coal briquettes.* 3, *Circulator for preheating gas.* 4, *Heat exchanger for heating the preheating gas by means of produced warm gas.* 5, *Coking shaft.* 6, *Electric furnace for heating the coke briquettes.* 7, *Apparatus for cooling coke briquettes by means of cold circulating gas.* 8, *Speed regulator for downward travel of briquettes, and gas-tight discharger.* 9, *Cottrell unit for tar separation.* 10, *Gas cooler and steam-injection unit.* 11, *Gas circulator.* 12, *Annular flue for discharge of hot gas.* 13 *and* 14, *Three-phase electrodes.*

The method used is shown in the drawing. The briquettes, pre-heated to 150° to 200°C., either in a separate apparatus (2) or as part of the subsequent coking process, are charged into the top of the vertical shaft (5). The briquettes pass slowly down the shaft, wherein they are preheated by hot gases. At the lower end of the shaft is an electric furnace containing two sets of three-phase electrodes. The carbonised briquettes, being now conductive, form the resistor element

which provides the heat for the process. The lower end of the furnace has a conical extension through which the coke briquettes are discharged as a finished product. Cold gas, introduced by booster (11) at the base of the furnace, cools the hot coke and is preheated. In the electric furnace the gas is further heated to 1,000°C. and reacts with the hot carbon, forming CO and H_2. As the hot gas flows up the furnace its sensible heat serves to carbonise the coal. Cooled to 200°C. and augmented by distillation gas and tarry vapours, it is purified in the by-product recovery plant. Part of the heated gas is used for carbonisation of a fresh charge of coal briquettes, while the remainder is piped off to be used for synthesis.

One short ton (2,000 lb.) of Longyear coal yields:—

Coke briquettes	1,250 to 1,300 lb.
Low-temperature tar ...	20 to 25 gal.
Gas	24,000 cu. ft.

The composition of the gas is as follows: H_2, 70%; CO, 27%; the remainder (CO_2, CH_4, and N_2), 3%.

Power Consumption

The power consumption is about 40 kWh/1,000 cu. ft. of gas produced. As the market value of the coal briquettes and coal tar at least equals the cost of the coal briquettes, the total cost of the produced gas consists of the electric power costs plus plant-operating and capital costs (depreciation and repairs). Plant operation should be a simple matter and repair costs are expected to be low.

Synthesis Gas

The gas as produced has a $H_2 : CO_2$ ratio of 2.6; to produce synthesis gas in which $H_2 : CO = 2$, it is only necessary to add blue water gas—*e.g.*, by adding steam to the circulating gas. An increased gas output will then be obtained at the expense of more valuable coke production, which means higher-cost gas. A better procedure would be to separate the raw coal into two products—one to give low-ash coke (about 4% ash) and another to give high-ash coke (about 30% ash). The latter product could then be gasified by steam in an electric furnace of the same construction as above, but without the vertical shaft.

If the gas mixture is to be used for synthesis of gasoline or diesel fuels—*e.g.*, the Hydrocol process—a plant capable of converting, say, 1½ mill. short tons of Spitsbergen coals yearly will give approximately 700,000 tons of low-ash coke briquettes, 750,000 barrels of low-temperature coal tar, and 2 mill. barrels of gasoline plus diesel fuel. The approximate power requirements would be 300,000 kW. A plant of this capacity would meet Norway's requirements of coke and liquefied motor fuels and would furnish valuable raw materials for the chemical industry.

At current prices, the estimated production costs for the gasoline product will be about 20 cents a gallon, which is about double the present cost of imported gasoline; but the trend of price may so reduce the difference that production of synthetic petrol in Norway may be feasible.

Alternatively, a gas of 500 B.Th.U./cu. ft. can be produced by disconnecting one set of electrodes, with a corresponding decrease in the power load. The resulting gas consists mainly of CH_4, H_2, and CO, with no heavy hydrocarbons. Electric power consumption will in this case decrease to about 400 kWh per ton of coal, possibly less for larger furnaces. One ton of Spitsbergen coal will produce about 1,350 lb. of coke briquettes, 20 to 25 gal. of low-temperature coal tar, and 10,000 to 11,000 cu. ft. of gas with a calorific value of about 500 B.Th.U. per 1,000 cu. ft.

The next coking plant to be built is expected to have a daily input of about 25 tons of coal briquettes. As shown by the drawing, this process will encounter no difficulties in regard to the cross-sectional distribution of briquettes and gas in the furnace. The heat distribution will also be good. In regard to the furnace capacity, the only limiting factor will be the required electrode voltage. Even for a furnace with 150 tons daily input the electrode voltage will not exceed 150 volts, which hardly presents any technical difficulties.

The resulting coke briquettes will have the properties of high-temperature coke with 1 to 2% volatile matter. They will have a compressive strength of up to 500 kg./cm^2. Chemically they will be highly active—at least as good as low-temperature coke. If sulphite waste liquor is used for briquetting, highly active coke will be obtained in any event, but where no binder is used (as in high-pressure ring-roll presses) reactivity can be controlled to suit metallurgical, foundry, and domestic requirements.

The present pilot plant can also be used for wood distillation, producing a gas-free, mechanically strong charcoal with recovery of all valuable by-products.

By minor changes in design it is possible to produce a very pure water gas from coke and steam, or, alternatively, pure carbon monoxide gas from coke and carbon dioxide by a continuous operation. Furthermore, green waste wood can be converted directly to synthesis gas in a simple operation without any by-products whatever, except for the pure CO_2 removed in the purification of the gas.

ASH ANALYSIS

During the last 25 years the Fuel Research organisation of D.S.I.R. has published several papers dealing with the analysis of fuels. These papers have described new methods of analysis and methods adapted from other fields to meet the requirements of fuel analysis. Many of these methods, which are only published after considerable experience within the organisation, have been adopted later as British Standards. In 1933, one of these papers, dealing with the analysis of coal ash, was issued as Fuel Research Survey Paper No. 28.

Recently there has been published Fuel Research Survey Paper No. 50 entitled 'Improved Methods for the Quantitative Analysis of Coal Ash and Coke Ash' (H.M.S.O. price 1s. 0d.; by post 1s. 2d.). This paper embodies many alterations found to be desirable and advantageous as a result of 15 years further experience in the Coal Survey Laboratories, now transferred to the National Coal Board, and in the Fuel Research Station. The changes made are clearly set out in the paper in a special section and only a few of the more important changes are referred to here.

The preparation of ash for analysis by the 'standard' method using small quantities of coal in thin layers is retained only for certain special analysis. A simpler and shorter method for the preparation of the 'bulk' sample is described with instructions regarding the application of correction factors.

The separation of silica has been simplified and the time of 'baking' has been reduced. This also has the advantage of making the dried residues more easily soluble.

At one time, the occurrence of barium in analytical quantities in coal was considered to be unusual, but its presence in many coals has now been confirmed and therefore a method for the determination of barium has been included in the general scheme. During the determination of silica, the presence of barium is easily recognised, and its determination is relatively simple.

The treatment of the iron 'group' has been changed so that no separations of members of the group are required; iron and titanium are determined separately by specific methods.

The technique for the determination of phosphorus has been completely changed. The new method is one devised originally by the Northern Coke Research Committee and the repeated fusion of the ash with sodium carbonate is avoided.

In Survey Paper No. 50 a new method of presentation has been adopted. In the section dealing with the actual analyses, precise and detailed instructions are given on the right-hand pages in a series of numbered paragraphs. On the corresponding left-hand pages, there are a series of notes to assist the analyst. These notes include suggestions for apparatus, the reasons for certain steps, and general precautions to be observed.

Attached to each copy of the paper is a diagram illustrating the analytical scheme and quoting the appropriate paragraph numbers that are concerned with each stage of technique. The diagram is arranged so that it may be detached from the paper for laboratory use. It can be framed or folded to fit in a standard card index drawer.

DOMESTIC HOT WATER*

By J. E. COOPER, B.Sc., M.Inst.Gas E., A.M.I.H.V.E., M.Inst.F.,
Technical Manager (Potterton Gas Division), Thomas De La Rue & Co., Ltd.

THE title of this paper has been deliberately chosen in order that we may broadly consider the subject of domestic hot water supply. It is not intended to mention the vexed question of district heating, except to say that while at first sight this method appears attractive there are on further consideration factors which lead one to conclude that considerable care is required before it is adopted. In this country the most common method of obtaining domestic hot water is by appliances under the control of, and in many cases owned by, the individual user. In large blocks of flats central plants supplying hot water are commonly fitted, but in general it is found that where a fixed charge as part of the rent is made for this service there is lavish use and running costs become high. One method of minimising this lavishness is to install in each flat a restrictive calorifier, so sized as to limit the amount of hot water available during a particular period. An interesting suggestion has recently been made in an attempt to lower the initial cost of boiler plant. In this arrangement one boiler does both central heating and hot water supply. This is made possible by a pipe-linking arrangement together with clock control. At certain periods the boiler is switched to water heating and at others it is supplying heat to the radiator system.

It is clear that for some long time the bulk of domestic hot water used in this country will be supplied by individual appliances—*i.e.*, one system per house and even in some modern blocks one per flat. In practically all post-war houses a back boiler is fitted and the intention is that solid fuel shall be responsible for supplying the bulk of hot water. In such property the use of gas or electricity for water heating becomes restricted—*i.e.*, both these fuels tend to be used mainly to supply hot water in summer, when it is not desired to light up the solid fuel fire, the boiler generally being fitted in the living room fireplace. When coke is used as solid fuel the gas industry preserves an interest in the supply of hot water, but in those instances where coke is not used and where at the same time an electric immersion heater is fitted, the industry suffers greatly. It is therefore necessary for us to analyse the whole position in order that on one hand the consumer can be well served and on the other that the gas industry keeps its place in this important application. As was pointed out by Purkis in his recent paper (1) to the London and Southern Junior Gas Association it is important that not only is the prime cost of the appliance to be taken into consideration but that in addition an account should be made of maintenance and running costs.

Hot Water Usage

Before dealing with the above points it is as well to consider the uses to which hot water is put domestically and the amount which is used. About half the total is drawn at the sink, the remainder being used, of course, mainly at the bath and wash basin.

Holliday (2), in Communication No. 278 (Institution of Gas Engineers) discusses the uses of gas for hot water supply, basing results on a usage of 250 gal. per week of water at 140°F. for a family of four people, this being taken as the standard size of family for this country. While the 250 gal. figure may be desirable it is in my view unduly high as a target and was not really intended by Egerton (3) to be anything other than a guide to the design of hot water equipment, the requirement being the ability of the installation to supply this quantity per week as a minimum. Bearing in mind the present-day cost of all fuels, it is likely that space heating will be regarded as being more important than water heating, and it is therefore probable that the use of hot water will tend to be kept to a minimum. Even the lower (150 gal. per week at 140°F.) standard of usage suggested by Holliday appears high, following recent surveys for the standard size of family—*i.e.*, two adults and two children of school age.

There is a tendency in larger blocks of flats to install a communal laundry, and the clothes washing load in this regard will be lost by the industry unless the heating of the water in the communal laundry is captured.

Present Day Appliances

For all-the-year-round supply of hot water two main ranges of gas appliances are available, viz:—(1) Instantaneous, (2) Storage.

Instantaneous.

The instantaneous multipoint heater gives adequate service if correctly installed and maintained. It is surprising to find even in these days that the principles underlying the working of this type of heater are not always clearly understood. Neither are basic matters such as operating head, minimum flow, and the pressure losses through pipes. An alternative to the multipoint is the use of two appliances—*i.e.*, a sink heater and a single point (bath) heater. This combination gives good service and running costs are somewhat lower than those of a multipoint heater. The main disadvantages are:—

(1) Two appliances and not one require maintenance.

(2) One heater, of high gas rate, is fitted in the bathroom. It is a fact that the consumer does not like draughts in this room and consequently ignores the requirements that air must be admitted for combustion. It is unfortunate that not all bath heaters are of high quality.

The boiling water sink heater is slowly finding favour and may be regarded not only as a prestige appliance which can be put forward as a reasonable proposition only by the gas industry but one which can give extremely good service even on hard water areas.

Storage.

This type of appliance gives extremely good service but for a given usage running costs are higher than those of the instantaneous heater. Capital cost tends to be high, but this is in part due to the fact that demand in this country has not been sufficiently high to merit the application of mass production.

There are two main lines of attack in deciding what type of heater shall be installed. One school of thought favours low recovery rate with large storage capacity, and another high rate or recovery and low storage capacity. A yardstick of performance is that the heater shall be capable of delivering two 15 gal. baths (at 140°F.) with a half-hour gap between commencement of delivery of the first and second lots and at the same time keeping available sufficient hot water for other uses. From the point of view of competition with electricity, high recovery rate, which cannot be matched, is attractive, but there is some evidence of interest in flueless storage heaters of low gas rate, this interest being probably inspired by the high cost of flue installations.

The sink storage heater is another useful appliance, particularly in those areas where frequent descaling is necessary. Commercially it appears to suffer from the disadvantage that electricity can do the job in an equally effective way and at reasonable running cost.

As part of these notes on storage heaters the gas circulator can be considered. This appliance is normally added to a solid fuel system mainly to provide summer hot water, and as a booster when, as I am told does happen, the back boiler or coke boiler has failed to give water of adequate temperature. The circulator is in itself a comparatively cheap appliance but installation costs are high if separate flow and

* Paper to the Eastern Junior Gas Association, Spalding, January 18, 1950.

return pipes are run and if they and the storage vessel are lagged. The temptation is to connect to existing flow and return pipes, but this practice is not to be recommended, for the following reasons:

1. Intercirculation can occur with the circulator in use, leading to high heat loss from the surface of the solid fuel boiler. This heat loss is increased if the chimney damper is open; valving to eliminate this intercirculation is not to be recommended.
2. Stratification will be poor, as normally the flow and return pipes for the solid fuel boiler will be too large.

From time to time attempts have been made to introduce gas immersion heaters for domestic use. They have not become popular, and I suggest that the main reason is the need to ventilate the appliance. The whole question of burning gas in linen cupboards must be approached with some care if only from the point of view of fire hazard and of the effects of products of combustion on certain dyes.

The South Eastern Gas Board has put forward an interesting device which is fitted to the wall of the storage vessel, normally taking the place of the manhole cover. The heater is finned on the outside to increase heat transfer and can be arranged to give stratification.

There is a growing tendency towards the use of communal laundries, particularly in large blocks of flats. This tendency is increasing, and in many towns washing can be taken to small laundry units and can be collected ready for ironing in the space of an hour. Hot water can best be supplied to these units by gas-heated storage systems, and in the supply of such equipment my company has been particularly successful. In this way compensation is obtained for the loss of the washboiler load.

The Future

In the solid fuel appliance industry the trend is a return towards dual or multi-purpose appliances. Thus the open grate with back boiler provides space heating in the room in which it is installed, and also water heating and, in some cases, ducted hot air to other rooms. It is common for the solid fuel cooker to provide hot water by means of a built-in boiler. This trend must be carefully watched by the gas industry, as the provision of summer hot water by means of an electric immersion heater is very attractive. Indeed, when the boiler is a part of a cooker, this appliance, as distinct from the open grate, can give hot water throughout the year. In passing, a gas heated multi-purpose cooker may be mentioned as a possible competitor. Turning again to the open grate with back boiler, it would seem that many families would be prepared to crowd baths into one or two days per week and light up the fire to supply hot water for this purpose.

A pressure-proof sink heater, which can supply water at the sink *and* the washbasin will complete the water heating equipment in such a household. Such an installation can be much improved if firing of the back boiler by gas, as an alternative fuel, can be arranged.

An interesting possibility is the use of an instantaneous heater with some form of thermostatic control, fitted to act as a booster. Such a heater is permanently in the draw-off pipe but does not light until the hot water temperature falls below a pre-set figure, say, 140° F. This heater not only secures that the consumer gets hot water of adequate temperature at all times, but also boosts lukewarm water which might otherwise be wasted. The disadvantage of such an appliance is that inevitably its design is somewhat complicated and maintenance costs may, therefore, be high.

There are two other changes from conventional instantaneous heaters which may help in the future. They are:—

(1) Balanced flue heaters.
(2) Built-in heaters.

The balanced flue heater is attractive in that its application removes the need to consider the question of air supply (for combustion) to the room in which it is fitted. The flue run also becomes simple and cheaper, as wall terminals, which at the one time evacuate products and let in air for combustion, can be universally used. The heater is in its infancy; the balancing of a high gas rate appliance is more difficult than that of balancing, say, a small radiator. Nevertheless, there is great possibility in balanced flue heaters.

The built-in multipoint heater deserves mention. In small kitchens it can be fitted 'out of the way' and be made much more a part of the equipment, rather than look something of an extra, or afterthought.

It is agreed that the adoption of gas for water heating has been, and will continue to be, jeopardised by the need to install flues. There is need to consider the possibility of employing mechanical extraction. This is a method which has not, up to now, been viewed with much favour by the gas industry, but its adoption would lead to interesting changes in the design of the appliance itself—*viz.*:—

(1) For a given duty the size of the heat exchanger could be reduced, as gas (products) speeds would be increased. The size of the heater could also be decreased.
(2) As an approximation an appliance requiring a 5 in. dia. flue under conditions of natural ventilation, could be vented by one of 2 in. dia.

Small fans driven by fractional H.P. motors are in common use as, for example, on some domestic solid fuel boilers. The deterrent to their use on gas water heaters is that in the event of fan failure, either because of a general power cut or for local causes, the heater is out of use. In addition, interlocking of the fan unit and the automatic valve is not simple.

Turning to the future outlook for storage water heating, it becomes clear that if the one storage vessel can be used for both the solid fuel and gas heating systems, the overall cost of the installation can be reduced below that of installing an additional vessel as part of the gas heating side. With the common vessel it becomes easy to use gas as a booster fuel, but, immediately, the question of ventilation arises. It may be possible to ease the problem by balanced flue arrangements, and if at the same time care is taken of surface temperatures the industry may come to accept the idea of fitting heaters in linen cupboards and other confined spaces.

For existing buildings with no hot water systems, a flueless low gas rate storage heater of attractive capital cost may prove a useful appliance. Here I will mention and then leave the question of sulphur in gas. With the newer methods of purification one can imagine a much wider use of flueless appliances of this kind.

Looking to the future in a more general way, it appears that two main markets will exist for gas water heating:—

(1) In existing property, and
(2) New (post-war) property.

For (1) there exists a good range of appliances, but for (2) a good deal of development work is required.

In various surveys it has been shown that the provision of hot water has, in many instances, been forgotten, and in others inadequately made. There is much leeway to be made up, the main restriction at the moment being the high level of purchase tax.

I feel that the need for correct installation of both instantaneous and storage heaters requires stressing. All too often, satisfactory appliances incorrectly installed have given bad service. This fact has resulted in a condemnation not only of the appliance in particular, but of gas water heating in general. Where existing storage vessels are to be used, the question of insulation must be carefully considered, and whatever method of heating is to be employed a general assessment *before* installation is commenced will almost always lead to satisfactory working.

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INSTALLATION OF LARGE INDUSTRIAL GAS METERS*

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THE continuing increase in demand for gas for industrial and commercial use in installations involving high gas rates has made necessary the development by meter manufacturers of meters capable of measuring such loads without undue increase in size.

The wet meter was in general use from 1817 until 1854 when the first practical dry meter, known as the lights meter, was developed. The standard meter, which was essentially a reclassified lights meter, was followed by the high capacity meter in 1926 and subsequent improvement in mechanical details has produced the super high capacity meter. In early days the variation in size as between different makers was pronounced, and Table I, giving dimensions of high capacity meters from four manufacturers, shows that these variations still exist.

Table 2 gives dimensions and weights of a range of meter capacities made by one manufacturer.

TABLE I.

Size and capacity cu.ft. per hour	Height in.	Width over flanges in.	Depth in.	Height to centre of flange in.	Size of connection in.	Weight Cwt. qtr. lb.
1,200	30½	30	20	20	3	1 1 12
1,800	37½	34½	23	26½	3	1 3 20
3,000	44½	42	26½	34½	4	2 3 0
6,000	56½	48½	31	41	6	6 0 0
9,000	63½	55½	36½	48	6	6 3 0
15,000	71	61½	46	49	8	11 3 0
25,000	80	70	56	61	9	19 approx.
50,000	85½	75	65	67	12	30 approx.

TABLE II.

Size cu.ft.	Maker	Height in.	Depth in.	Width over flange in.	Height to centre of flange in.
1,200	A	30½	20	30	20
	B	30½	20	30½	20
	C	33⅜	22	31	23¼
	D	32½	19½	30½	20
1,800	A	37½	23	34½	26½
	B	37½	23½	34½	26½
	C	41½	26	35½	29½
	D	37½	23½	34½	26½
3,000	A	44½	26½	42	34½
	B	45½	25½	42	34½
	C	48½	30½	39¼	34½
	D	48½	26½	42	34½
6,000	A	56½	31	48½	41
	B	55¼	32	48½	40½
	C	61	38	48	43
	D	57½	33½	51½	40½

Other types of meter for large capacities have also been developed, and a few of these are in use in the Gas Light area of the North Thames Gas Board, but generally the normal dry type of meter is used.

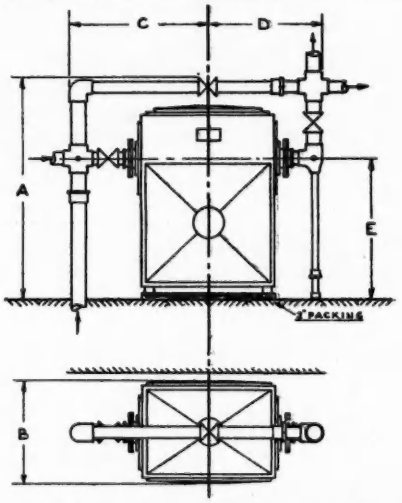
Over 10,000 of these, ranging in size from 700 cu.ft. to 60,000 cu.ft. capacities, have been installed.

Installation of Meters

Although the position of the meter is often governed by the available positions for entry of the service and consideration of expediency, the following points should be borne in mind: The meter must not be subjected to extremes of temperature and a site should be chosen where this remains reasonably constant. Damp conditions will cause rapid deterioration of meter cases. Adequate ventilation is, therefore, necessary. Apart from general convenience, the site should be accessible for the following reasons: (a) To allow the inlet valve to be closed quickly in case of emergency; (b) to save time when carrying out periodic oiling; (c) to facilitate exchange in the event of breakdown (if the meter is hired to the consumer this operation may have to be carried out at the Board's expense).

Large meters, due to their bulk and the comparative fragility of the case, are not easy objects to handle. Serious damage can result from careless slinging and skilled labour should be employed. The meter department of the North Thames Gas Board is equipped with a fork lifting truck which will lift a load of two tons to a height of 9 ft., enabling a meter to be picked up from a lorry without risk of damage and lifted or lowered into position. This truck is mobile, and can be sent out to assist in the handling of large meters on site.

Before the present range of large meters was available it was sometimes expedient to fit numbers of meters in parallel. In such cases all the outlets were married into a common outlet supply line. It has been found conclusively that this arrangement is bad practice, since one meter is sure to respond quicker to the demand, and can be overworked and overloaded.



METER CAPACITY CU.FT./HR.	MINIMUM DIMENSIONS								APPROXIMATE WEIGHTS WITH CONNECTIONS
	HEIGHT	DEPTH	WIDTH		HEIGHT TO CENTRE OF FLANGE	WIDTH OVER FLANGES	CONNEC-TIONS	BY-PASS	
	A *	B	C	D	E	F			CWT. QTRS. LBS.
1,200 H.C.	3'-11"	1'-10"	2'-4½"	1'-11"	2'-1"	2'-7"	2"	1½"	2-0-0
1,800 H.C.	4'-8"	2'-2"	2'-10⅝"	2'-3½"	2'-7½"	3'-0"	3"	2"	3-2-0
3,000 H.C.	5'-6"	2'-7"	3'-4"	2'-8"	3'-1"	3'-6"	4"	3"	5-1-0
6,000 H.C.	6'-3"	3'-2"	3'-9"	3'-1"	3'-8"	4'-4"	4"	3"	8-2-0
9,000 H.C.	7'-1"	3'-4"	4'-0⅛"	3'-7½"	4'-2"	4'-10"	6"	4"	11-2-0
15,000 H.C.	7'-5"	3'-10"	4'-8⅛"	3'-9⅝"	4'-3"	5'-2"	6"	4"	15-2-0

* INCLUDES 2" PACKING

IF INLET AND OUTLET VALVES HORIZONTAL WIDTH WILL BE TWICE C
" " " " " VERTICAL " " " " D
" " " " " DISSIMILAR " " " C + D

Fig. 1.—Overall dimensions of large meters complete with connections.

Installation of several meters serving ring outlet has sometimes been adopted in sports stadiums, exhibition halls, theatres, &c., with the object of ensuring an uninterrupted supply of gas should one meter or service be out of commission either for repairs or breakdown. Most large meters are made without back stops (and are marked accordingly); hence they are capable of working backwards under certain conditions. Every meter fitted in these circumstances should have (on the outlet) a non-return valve which should be periodically maintained.

* Paper to the London and Southern Junior Gas Association. December 9 1949.

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Meter Connections

It is the general practice on the Gas Light area to fit by-passes to industrial meters. The non-scale drawing, Fig. 1, is available for representatives and is intended to cover the normal conditions that are met on the district. The minimum dimensions given are only applicable to the four makers at present supplying large meters to us.

The final connections to the inlet and outlet of the meter are made by using matching flanges and meter connectors, and the method adopted is as follows: A matching flange, the centre hole having a B.S.P. parallel thread, is attached to the meter flange by using a corrugated lead washer well smeared with red and white lead. The bolts used for bolting these flanges together are each treated with hemp round the threads and painted. Grummets of hemp at the shoulders of the nuts and bolts ensure a gas-tight joint.

The parallel thread of the meter connector, a very short longscrew without the socket, is run into the flange. With the inlet and outlet supply lines in position the meter connector is then run back so that the taper thread enters the tee or valve making a gas-tight joint. The back nut on the connector is then tightened up and made good against the flange. By this method the minimum of strain is placed on the sides of meters when installed, and there is a certain amount of tolerance available at any subsequent exchange.

A suggestion has been made to eliminate the flange joint by embodying a screwed boss in the construction of the meter. This modification would reduce installation costs and incur very small alteration when exchanging old meters for the new types, since the principle of the use of connectors is maintained.

Where the inlet and outlet supply lines come from above the meter, it is our practice to support the weight by legs made from barrel. These legs also serve to collect any rust or foreign matter which might otherwise enter the meter. The connections on both sides of the meter are drilled and pressure nipples fitted to facilitate the checking of service pressures and the pressure loss through the meter.

Since the pressure drop at full load through the by-pass need be no less than that through the meter itself the opportunity is taken to effect some economy by fitting a by-pass and valve at least one pipe size smaller than the meter connections.

The by-pass cock or valve should be sealed to prevent its being operated by persons other than the Board's officials. The Foulgers by-pass seal was the standard method used up to 1945 by the Gas Light and Coke Company. This has now been replaced by a much cheaper and simpler method both for main cocks and vales. The main cock key is secured to the head of the plug by means of a split pin. Two holes are drilled near the head of the key and one as near the end as possible. A 20 S.W.G. copper wire is passed round the cock and connector tightened by twisting, then through the holes in the key. The ends are given a further twist and sealed with the Board's standard lead seal.

In order to seal a valve the copper wire is passed round the bolts used on the stuffing box flange, given a few twists, secured to the spokes on the hand wheel, and the ends are covered with the lead seal.

Meter Valves

On the 700 cu.ft. HC and 1,200 cu.ft. HC meter sizes, 2 in. full bore brass cocks weighing 10 lb. are used, the design of which makes for a neat installation. Light pattern cast iron meter valves (which weigh 36 lb. and 52 lb. respectively) are used for 3 in. and 4 in. connections. These valves require one and three-quarter turns of the wheel on the spindle to

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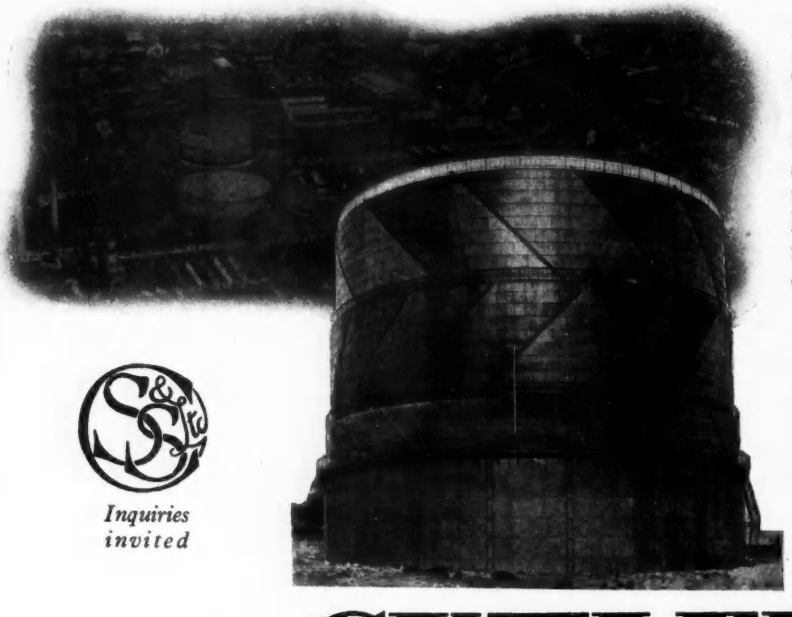

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turn the valve from the open to the closed position. It is advisable that the rack on the slide should be on the outlet side of the valve. It is then possible to repack the glands or replace the pinions on the inlet and outlet valves while gas is passing through the by-pass. This cannot be done, however, in the case of the by-pass valve itself.

The valves for supplies of 6 in. and over are usually much heavier in proportion to the 3 in. and 4 in. sizes. One type of 6 in. valve weighs 1 cwt. Also the number of turns required to turn the larger type of valve from the open to the closed position is considerably increased. Since these valves usually operate in the reverse direction to the rack and pinion type all meter valves should have clearly indicated the direction in which the wheel is to be turned for opening and closing.

The question of prefabricating the connections and by-passes of large meters has been under consideration by the North Thames Gas Board in an endeavour to reduce the installation costs.

SUBMERGED COMBUSTION

IN a recent paper to the Institution of Chemical Engineers and the Chemical Engineering Group of the Society of Chemical Industry, Mr. **Norman Swindin** remarked that the most important advantage of submerged combustion is the generation of a large quantity of heat in a confined space and the almost instantaneous transmission of this heat to the liquid. It is possible to release 30 mill. B.Th.U. per cu.ft. per hour in small burners, but the temperature attained is too high for continuous running as most refractories are melted out. In practice design is based on 7 mill. B.Th.U. per cu.ft. per hour.

The main object, in developing the submerged burner, said Mr. Swindin, was to work out a satisfactory plant and process for the treatment of spent pickle from steel works. The installation of the large continuous strip steel rolling plants at Ebbw Vale and Shotton created the problem of disposing of immense quantities of spent pickle. This problem is discussed in the author's paper of 1944‡, but the 'Swindin' process—evaporation by the submerged burner—was only touched on. The great advantages of evaporation processes over cooling processes are that the liquors are not cooled and that the iron sulphate is recovered as the monohydrate for roasting to SO_2 for conversion to acid again. After developing a reliable and robust burner it was found that the burner soon choked at the mouth with the iron monohydrate sulphate. Many efforts to overcome this trouble were tried, such as nozzling the mouthpiece to increase the velocity and blow off the deposit, seeping water round the nozzle through perforations to dissolve the sulphate, using pokers operated mechanically to clear the mouthpiece. An automatic poker arrangement consists of a hollow chisel-shaped cutter fitted to a rod so that it can pierce the mouth of the burner. This rod is worked by an air cylinder, the valves of which are controlled by a solenoid actuated by an electric current in turn controlled by a relay switch operated by the difference of level in the mercury gauge of the orifice meter. The pressure drop across the orifice falls as the flow of air diminishes owing to the closing up of the burner mouthpiece or nozzle. The first experimental poker was operated manually, the operator keeping his eye on the orifice gauge. As the flow fell below a certain limit the poker lever was operated.

At first, evaporation of the pickle liquors was arranged to take place at an acid strength of 30%, at which concentration choking occurred every five minutes or so. Tests were made to see what happened at other strengths. For instance, at 40%, 50%, and 60%. At 40% choking was much reduced, while at 50% it almost ceased. It should be remembered that the experimental burner was only 2 in. diameter, consuming about 200 cu.ft. per hour of 500 C.V. coal gas, generating heat at the rate of 7 mill. B.Th.U. per cu.ft. per hour. Experience has shown that the larger diameter burners do not choke, but clear themselves by blowing and breaking off the incrustation as it forms. The use of the poker for clearing the nozzles of burners evaporating pickle liquors is now discontinued.

The first experimental burners were crudely constructed of mild steel tubes with welded-on flanges, protected against corrosion with lead or Vulcoferran (a slightly flexible ebonite), sometimes made of stainless steel, monel metal, and even silicon iron and enamelled iron.

The combustion surface inside the tube was a Morganite tube or some plastic refractory, but considerable heat was lost by radiation from the top flange. Heat that passes through the walls of the burner tube is absorbed by the liquor and is, of course, not lost. That which escapes through the top flange is lost. This was remedied by welding on or casting a jacket or cavity on to the cover, through which the mixed gases passed on their way to the combustion chamber, care being taken to see that the velocity of 150/200 ft. per second was maintained.

A word on mixing the air and combustible gas. Most workers in this field have worried themselves unduly to ensure thorough mixture. All sorts of devices, consisting of gauzes, perforated plates, discs, made of crimped metal ribbons wound round a stout wire, have been tried, but in practice they become choked with dust, dirt and iron oxide from the gas. In practice there is no such thing as clean gas.

Years ago Osborne Reynolds discovered that fluids flow in two ways—one turbulent. Then why not see that turbulent flow is obtained and leave it at that. Again, apart from explosions flames do not travel very fast—nothing like 100 ft. per second.

At the beginning of the paper the author explained that if ordinary coal gas with a gross calorific value of 500 B.Th.U. per cu.ft. is burned with the proportion of air required for complete combustion in a submerged burner in a vessel containing water there is at first an appreciable increase in the quantity of water in the vessel—assuming that we start with cold water—and it is only when the water has been heated above the temperature at which the products of combustion are saturated that evaporation takes place. If the water is maintained at a fixed level by the continuous addition of cold water to replace that which is evaporated it will be found that the maximum water temperature which can be attained is 90° C. This is the 'boiling point' of water under submerged combustion conditions and depends upon the composition and calorific value of the gas and also upon the proportion of excess air. Any air in excess of the theoretical causes a fall in the 'boiling point' temperature due to the increased proportion of non-condensible gas and subsequent reduction in the partial pressure of the steam. By increasing the pressure at which the steam and products of combustion escape from the evaporator the partial pressure of the steam can be increased with a corresponding increase in the 'boiling point.'

‡ Trans. Inst. Chem. Eng. 1944, **22**, 46.

Under the Purchase Tax (No. 6) Order, 1949 (S.I., 1949, No. 2453), the tax on thermal storage water heaters suitable for operation from electric mains is reduced from 100% to 66⅔%, and instantaneous water heaters which are not suitable for operation from electric or gas mains are exempted from tax. The tax reduction applies only to water heaters of the self-contained type, *i.e.*, the factory-made assembly comprising an insulated vessel, heater, and thermostat complete in an outer case, while the tax exemption applies only to instantaneous water heaters not operable from the mains, *e.g.*, instantaneous heaters using 'bottled,' or calor, gas.

Developments in the technique of resistance welding were described by Mr. C. A. Burton, in a paper to the North London branch of the Institute of Welding, on January 19. The basic principles of spot welding in which the developments from the single spot weld up to series spot welding and multiple spot welding were defined. Practical applications of multi spot welding were illustrated by slides and production times were given to enable comparison to be drawn with similar articles produced on single spot welding machines. Latest developments in light alloy spot and seam welding operating on the new 'three-phase' balanced load principle were explained and slides illustrating welding current wave form and actual machines were shown. Seam welding equipment was finally discussed, with slides illustrating special high speed production applications, such as shock absorber components, &c.